LANGER HEINRICH URANIUM (PTY) LTD ENVIRONMENTAL MANAGEMENT PLAN

JULY 2023

Langer Heinrich Uranium (Pty) Ltd

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SECTION A

INTRODUCTION AND ENVIRONMENTAL MANAGEMENT FRAMEWORK

A.1 INTRODUCTION

In 2005 Langer Heinrich Uranium (Pty) Ltd (LHU) was granted a Mining License (ML 140), to mine and process uranium oxide (U_3O_8) at its site located in the Namib-Naukluft National Park (Figure A. 1). LHU also acquired an Exclusive Prospecting License (EPL 3500) immediately west of ML140, which was converted to ML 172.

As part of the ML-application process (2005), an Environmental Impact Assessment (EIA) Report (Softchem, 2005) and Environmental Management Plan (EMP) (ASEC, 2005) for Langer Heinrich Mine were submitted and approved by the relevant authorities. The EMP was then revised and approved by the Directorate of Environmental Affairs (DEA) at the former Ministry of Environment and Tourism (MET) in 2008 (LHU, 2008).

In 2008 the operations were expanded. A detailed cumulative assessment of the existing (Stage 1 and 2) operations was conducted and the original ecological baseline studies were extended through external specialists at the same time. The EMP was amended to take cognisance of the original EIA requirements and the additional ecological specialist studies. This was approved by the Office of the Environmental Commissioner in the DEA.

In 2009 an EIA process was conducted for the Stage 3 Expansion Project at LHU, which was approved by the DEA in the same year. LHU conducted another EIA for their proposed Stage 4 Expansion Project in 2011/2012. Despite the fact that LHU gained Stage 4 approval, the holding company decided not to proceed with the ramp-up. This decision was solely based on the negative uranium market conditions.

Due to the prevailing low uranium price the holding company decided to place LHU under Care and Maintenance in June 2018. However, the ECC that was issued by the DEA for Stage 4, allowing for increased production and associated activities at LHU, remained the valid ECC. This ECC has been renewed every three years and is still valid until August 2023. A pre-feasibility study to restart the mine and Return to Production was completed in June 2020 followed by a valued add study in June 2021. In July 2022 the holding company announced the final investment decision to *Return to Production*, planned for the first quarter of 2024.

To ensure ongoing compliance, LHU has been required to renew its current (valid) ECC, taking the *Return to Production* project and associated activities, including the increased water requirements to the mine, into account. Subsequently, and as part of the ECC along with the plans for the restart of LHU, the proposed changes to the activities and the associated key environmental impacts, were ‘re-assessed’ by means of a Scoping (including an Impact Assessment) Report and where relevant, the EMP was reviewed, and changes / additional management and mitigation measures included in the (amended) EMP (this document).

Although the EMP for LHU has been amended before, and now again, it is still relevant and applicable to the proposed 'Stage 4 Expansion Project.

Table A. 1 is a summary to highlight the issues identified in the 2011 EIA (i.e. for the proposed Stage 4 Expansion Project) and the corresponding management and mitigation plans (MMPs), including those designed to meet legal requirements and minimise the impacts associated with uranium mining in a national park. The MMPs have been compiled / updated based on a review of the management commitments in the 2008 and 2009 EMP as well as the findings and recommendations of the 2011 EIA.

Changes relating to Section A were made. These changes include, amongst others, editorial corrections and updates, as well as removing information previously adopted by LHU, to ensure the EMP is ‘streamlined’ as far as possible for improved efficiency during implementation.

Relevant to the latest EMP (this document), the MMPs in Section B were also reviewed and changes were made where required. Some other, minor, changes in Section B (including editorial corrections and updates) were also made. Monitoring requirements were included in Section B (former Section C) and relevant / further details are included in Appendix 3.

Table A. 1: Summary of issues identified in the 2011 EIA and corresponding management programmes

Environmental component	Issue	Relevant MMP (Reference to relevant MMP in the EMP)
Topography	Hazardous excavations and infrastructure	MMP B1.1 – Stakeholder consultation MMP B.1.2 – Safety and Security
Soil and land capability	Loss of soil resources from pollution	MMP B.1.9 Soil MMP B.1.11 – Waste Management
	Loss of soil resources from physical disturbance	MMP B.1.9 – Soil
Biodiversity – Natural vegetation and animal life	Physical destruction of biodiversity	MMP B.1.3 – Biodiversity
	Reduction of water resources as an ecological driver	MMP B.1.3 – Biodiversity MMP B.1.5 – Surface Water MMP B.1.6 – Groundwater MMP B.1.7 – Resources
	General disturbance of biodiversity	MMP B.1.3 – Biodiversity MMP B.1.9 – Soil MMP B.1.11 – Waste management
Surface water	Altering drainage patterns	MMP B.1.5 – Surface Water
	Pollution of surface water	MMP B.1.5 – Surface Water MMP B.1.11 – Waste Management
Groundwater	Dewatering	MMP B.1.6 – Groundwater
	Contamination of groundwater	MMP B.1.6 – Groundwater MMP B.1.11 – Waste management
Air quality	Air pollution	MMP B.1.8 – Air quality
Noise and vibrations	Noise pollution	MMP B.1.12 – Noise and Vibrations
	Vibrations	
Archaeology	Damage to archaeological resources and landscapes	MMP B.1.15 – Archaeology
Visual	Visual impact	MMP B.1.10 – Visual
Socio-economic	Economic impact	MMP B.1.13 – Socio-Economic MMP B1.1 – Stakeholder consultation
	Road use and traffic impacts	
	Inward migration	
	Social wellbeing impacts	
Radiological	Direct exposure to radiation from on-site sources	MMP B1.14 – Radiological MMP B.1.2 – Safety and Security
	Aquatic and atmospheric pathways	
	Secondary pathways	

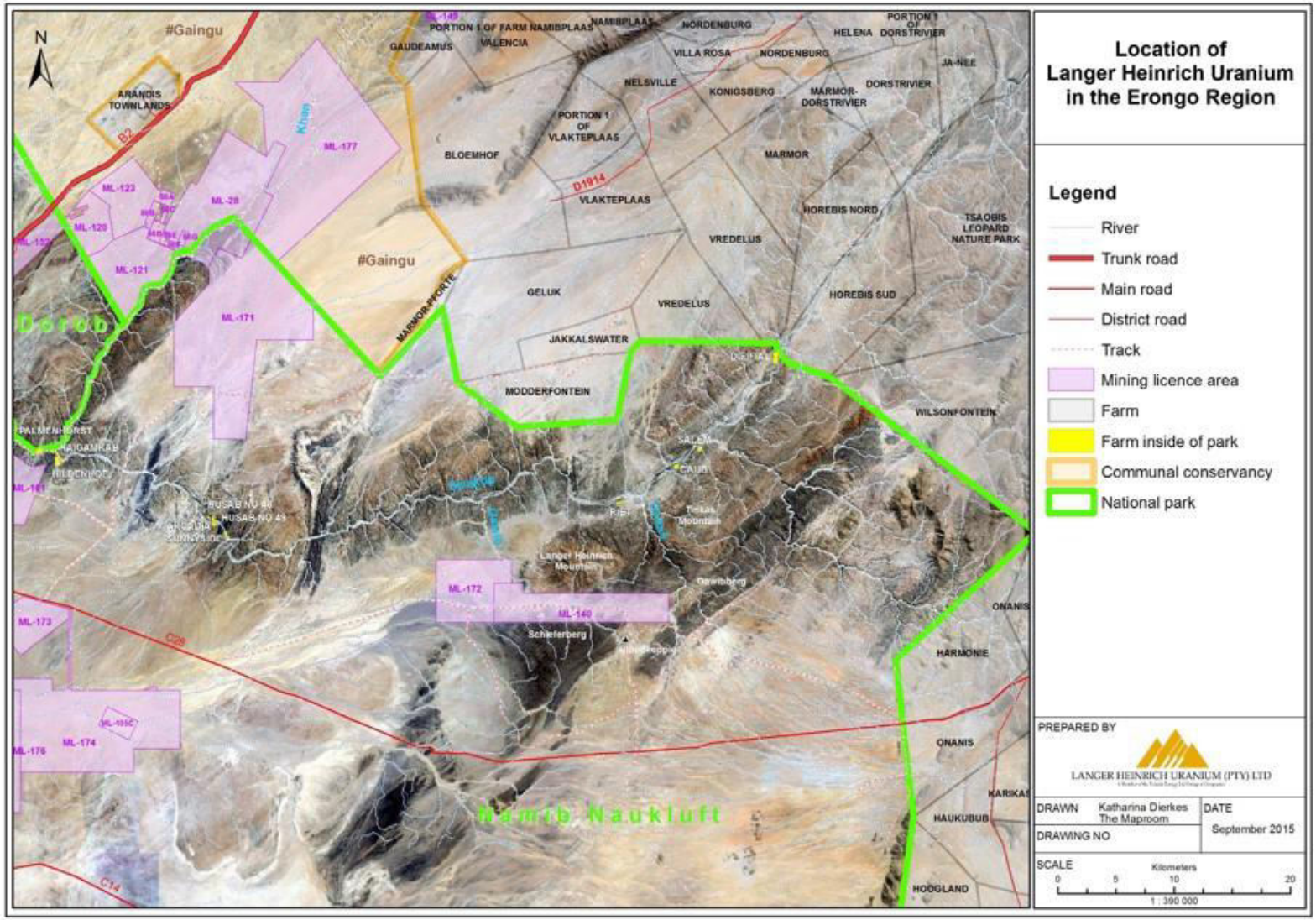
On request of the former DEA at MET (now the Ministry of Environment, Forestry and Tourism – MEFT), the draft EIA regulations (April 2009) have been used as a guideline for the EMP.

The required components of the EMP are included in Table A. 2:

Table A. 2: Requirements for the content of the EMP

Draft EIA Regulation requirement	Reference in the EMP
Details of the persons who prepared the EMP and the expertise of those persons to prepare an environmental management plan.	Section A.1.3.
Information on any proposed management or mitigation measures to address the environmental impacts that have been identified in a report contemplated by these regulations, including environmental impacts or objectives in respect of – i. Planning and design ii. Pre-construction and construction activities iii. Operation or undertaking of the activity iv. Rehabilitation of the environment v. Closure, where relevant	Section B – MMP B.1.1 to MMP B.1.15
A detailed description of the aspects of the activity that are covered by the EMP.	Section A.2 Section A.5
An identification of the persons to be responsible for the implementation of the mitigation measures.	Section B.2
Where appropriate, time frames within which the measures contemplated in the EMP must be implemented.	Section B.2.4
Proposed mechanisms for monitoring compliance with the EMP and reporting on it.	Section B.1 (relevant MMPs) Section B.2.1.3 Appendix

Figure A. 1: Map showing location of ML 140 and ML 172



A.1.1 Background regarding environmental approvals

A.1.1.1 Documentation submitted during the approval processes

The relevant documents submitted to the government notifying and seeking environmental approval regarding the initial ML application (mining and processing activities) as well as expansion projects to date:

- An Environmental Assessment Report (EAR) (Softchem, 2005), submitted to the MET;
- EMPs for both the construction and operational phases (ASEC, 2005), submitted to MET and Ministry of Mines and Energy (MME);
- A Bankable Feasibility Study (BFS) (GRDMinproc, 2005), submitted to MME;
- An Accessory Works Plan (2006), submitted to MME;
- A mine contract plan (GRDMinproc, April 2006), submitted to MME;
- The EMP was amended (LHU, 2008) to cater for expansion activities and approved in 2008 by MET;
- An EIA Report (Metago, 2009) for the 2009 EIA was submitted for approval in 2009.
- In 2011 the EIA Report (Metago, 2011) for the Stage 4 Expansion Project and EPL 3500 conversion activities, accompanied by an EMP (Metago, 2011) were submitted to the DEA at former MET for approval. An ECC was issued in 2012.
- The EIA Report accompanied by the EMP (Metago, 2011) was also submitted to MME as part of the mining licence application for ML172.

A.1.1.2 Environmental authorisations granted

LHU has been issued with, amongst others, the following environmental authorisations (relating to the initial ML application - mining and processing activities, as well as expansion projects to date).

- A Mining License (ML140) was awarded in August 2005;
- An ECC was granted for ML140 in August 2005;
- The EMPs were approved and a proforma contract was signed in April 2006;
- An ECC was awarded to LHU in October 2008 for the updated EMP (Stage 2 Expansion)
- An ECC was awarded to LHU in November 2009 for the Stage 3 Expansion Project (Stage 3 EIA and EMP).
- An ECC was awarded to LHU in 2012 for the Stage 4 Expansion Project (Stage 4 EIA and EMP) with the successful inclusion of ML172.
- The ECC was renewed every three years and is still valid until August 2023.

A.1.2 Keeping EMPs current

In the introduction to the first EMP for operations (ASEC, 2005), it is indicated that:

''this should be seen as a 'living document' which will be amended during the operation, as activities might change or new ones be introduced.''

This is in line with Section 50 (g) of the Minerals (mining and Prospecting) Act, 33 of 1992, which states that the holder of a mining license shall undertake the periodic review of the EMP(s), should circumstances change.

Despite only being operational for a couple of years, LHU has seen a number of changes in its operations. Similar to the 2009 EIA, the 2011 EIA considered all impacts in a cumulative manner such that the impacts of the activities and those potentially associated with the proposed expansion projects were discussed and assessed together, allowing for improved management and mitigation measure to be developed.

A.1.3 Details of the persons who prepared this (fourth amended) EMP

Metago Environmental Engineers (Pty) Ltd (Metago), the independent firm of consultants undertook the 2011 EIA and compiled the EIA Report (Metago, 2011) that (together with the 2009 EMP) forms the basis of this EMP. The EMP was jointly prepared by LHU and Metago.

The update and amendment of the latest EMP (this document) was done by Namisun Environmental Project and Development, an independent environmental consultancy firm which was appointed by LHU for this task.

A.2 SCOPE OF THE EMP

A.2.1 Scope of work

The EMP provides a description of the activities and associated environmental impacts relating to the current LHU activities and surface infrastructure as well as the activities and infrastructure associated with the (Stage 4) Expansion Project.

The EMP (this document) was updated based on the 2023 renewal application process of the ECC. The updates to the EMP also took into consideration the 'reassessment' of some of the proposed changes to the activities and the associated key environmental impacts implied by LHU's 'Return to Production' plans – as contained in the associated Scoping (including an Impact Assessment) Report. The application process for the renewal of the LHU ECC focuses on the relevant changes (proposed) by LHU, as described in the above mentioned Scoping Report (only).

A.2.1 Description of infrastructure and activities

The LHU's key surface infrastructure is described in Table A. 3 and Figure A. 2.

The main components (i.e. activities and infrastructure) of the LHU of the LHU process flow include the following:

- Open pit mining
- Crushing and scrubbing
- Cyclones and screening
- Pre leach thickeners
- Leaching
- Counter current

- Ion exchange
- Precipitation, thickening and centrifuging
- Product drying and drumming

Table A. 3: Summary of current/approved LHU infrastructure

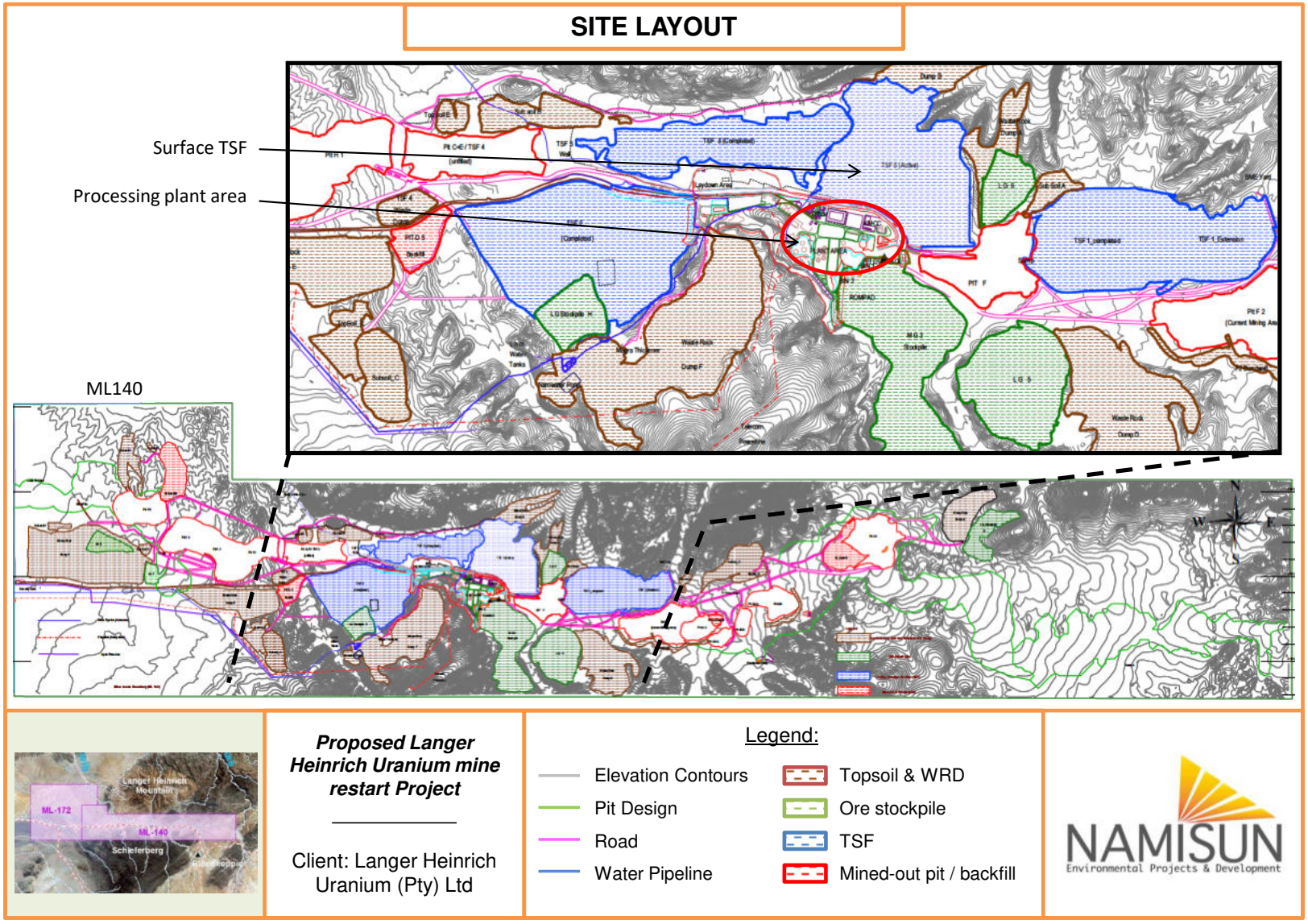
Infrastructure	Description
Access road	The access road to the mine joins the regional C28 road. All employees, contractors, input materials, waste materials and product are transported to or from the site use this road. From the C28 the traffic flows are split between the roads to Walvis Bay, Swakopmund and Windhoek.
Airstrip	A 1.3 km gravel runway (for emergency landings) is located on the gravel plains on the western side of ML140 about 300m north of the mine access road.
Coarse rejects stockpiles	There are currently 2 stockpiles, one east of the existing process plant and one south of waste rock dump A.
Exploration camp	An exploration drilling contractor camp is located in the southeast of ML140, approximately 5km east of the processing plant. Approximately 30 people are onsite at any one time.
Contractor lay-down area	This is a site used to accommodate any short-term contractors. It consists of a yard with storage and ablution facilities. It is located within ML140 to the west of the processing plant.
Conveyors	Conveyors are used to transport material at the front end of the processing plant between the crushers, scrubbers, and some of the stockpiles.
Exploration drill rigs and network of holes	Exploration drilling is a continuous activity and is used to upgrade the mineral resource on an annual basis as well as assist detailed mine planning.
Explosives	The explosives compound is located on the eastern side of the mine lease and is accessed by a single controlled access road. It houses heavy energy fuel (HEF) non-explosive oxidising agent storage tanks with an unloading bay and there are two fenced explosive magazines.
Fuel storage facilities	There are a number of aboveground diesel and heavy fuel oil (HFO) storage tanks located in covered and or bunded areas adjacent to the existing processing plant. Small petrol drums (400 litres in total) are stored in a bunded area. This petrol is used for small mining vehicles.
Internal haul roads	There are a number of internal dirt haul roads on the mine lease. Trucks are used to haul ore, waste rock and coarse reject materials.
Laboratory	Samples of solids, liquids, pulp and resin from the processing plant are analysed at the assay laboratory. Analyses include: • XRF (uranium and vanadium mainly) • Ore moisture • Titrations • Total suspended solids

Infrastructure	Description
	The laboratory is also equipped for analysis of environmental (dust and water) samples. The results from the analyses are used for process control, metal accounting purposes and water quality and dust monitoring. Any excess sample volumes are returned to the process before the sample containers are cleaned out for re-use.
Low-grade stockpiles	Currently low-grade ore material is stockpiled to the east of the processing plant and provision has been made for additional stockpiles within ML140, as required.
Offices, stores and workshop	The main office complex is located within the security fence directly north of the existing processing plant. An engineering block is located between the process dam and the engineering workshops. Activities associated with the workshops include painting, grinding, welding, repairs, and general maintenance. The front-end process control room is located inside the laboratory building which is situated adjacent the Counter Current Decantation tanks in the plant area. The back-end process control room is located in the recovery building. The mining contractors have their own office and workshop with a fuel storage facility and tyre workshop directly to the east of the main office complex. The following items are kept in store: reagents – sodium carbonate, sodium bicarbonate, sodium chloride, flocculant, hydrogen peroxide, sodium hydroxide, sulphuric acid and ferrous sulphate; personal protective equipment, paint and general maintenance equipment, etc.
Open pit mine	Mining is performed using conventional open pit mining methods. In accordance with current approvals the dimensions of the total mined areas will be in the order of an 11.5 km (east / west) long pit. The average width (north / south) will be 400 m and the average depth will be 30 m, although the deepest point will be 80 m below ground surface.
Open pit de-watering facilities	Water seeping into the pits is pumped via pipelines to either the (Tailings Storage Facilities) TSFs or process water dam or stored in the pits and occasionally used for dust suppression.
Ore stockpiles (ROM)	The mined ore is stockpiled directly east of the existing processing plant on the ROM pad, south of pit A.
Pipelines	A number of internal pipelines are used for the transportation of water, gas, diesel, air, reagents, process plant solution and tailings. The main external pipeline is for water supply from NamWater via the Swakopmund reservoirs. The pipeline has a number of pumping stations along the route. A shorter pipeline supplies water from boreholes in the Swakop River and LHU have authority to receive 0.5 million m^3 per year from this source.
Powerlines, substations and diesel generators	Electricity is supplied from the NamPower Kuiseb substation which connects to the mine via a 50 km 66 kV powerline and supplies approximately 16.6 MVA. A diesel generator facility with a capacity of 10 MVA is used to augment the NamPower supply. Power is distributed via an onsite substation and internal powerlines.
Processing plant	The existing processing plant is located more or less centrally of ML140.

Infrastructure	Description
Sewage plant	A bio-treatment sewage treatment plant with three modules is located directly west of the main office buildings and have a capacity of 50 m^3 a day
Tailings storage facilities (TSFs) and thickener	The temporary TSF (TSF1 and TSF1 extension) is situated partially on top of the ore body to the east of the main office and processing plant and will be re-treated and removed as part of future mining operations. TSF2 is located to the west of the processing plant and TSF 3 and 5 are north of the plant. Supernatant water is pumped back from this facilities to the processing pond via a pipeline to be recycled back into the process plant. Ongoing studies are considering in pit tailings deposition as outlined in previous EIA Reports.
Topsoil stockpiles	Topsoil is currently stockpiled at various locations on the mine lease.
Waste Rock Dumps (WRDs)	There are WRDs located to the north, east and west of the processing plant.
Radioactive waste disposal	Disposal sites for radioactive contaminated materials / waste (old personal protective equipment, drums, pipes, etc.) have been established in various waste rock dumps and in dedicated areas on TSF 2.
General and non-radioactive hazardous waste	Facilities are provided for sorting and temporary storage prior to removal and disposal. Final disposal of these waste types is by contractors at licensed facilities in Walvis Bay and Swakopmund.
Water storage facilities	Two lined raw water “turkey’s” dams store water that is pumped from the Swakop River and the saturated water (elevated salt levels) from the reverse osmosis plant. NamWater water is stored in four reservoirs to feed the process plant as needed. The process water dam is a lined facility and receives water from the TSF return circuit, the open pits, the treated sewage water circuit, laboratory, wash bays, plant run-off and the process plant circuit. As mining advances, the worked-out Pits A and F will be used to contain stormwater.
Water treatment	A reverse osmosis plant (water treatment plant) is used to treat water (NamWater and Swakop River) as required.

Refer to Section 7 of the EIA Report (Metago 2011) for a detailed description of the proposed Stage 4 Expansion Project as well as the activities and facilities associated LHU’s operations.

Figure A. 2: Site plan of LHU



A.3 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

LHU has implemented an environmental management system. The EMS ensures that the environmental management mitigation controls on LHU's activities are properly planned for and implemented to ensure compliance to LHU's environmental management requirements.

The EMP forms the basis of the EMS and all the associate programmes, procedures, work instructions, etc. are aligned, updated and improved where relevant.

A.3.2 Environmental Management Programmes

This EMP is be used to further develop / update the Environmental Management Programmes. The Programmes are updated to ensure the objectives provided in this EMP are achieved and commitments are implemented. Where required, the relevant EMS Procedures or Work Instructions and or related documentation will also be amended to ensure proper implementation.

A.4 ENVIRONMENTAL LEGISLATION APPLICABLE TO URANIUM MINING IN NAMIBIA

LHU complies with all Namibian legislation.

LHU has developed an Environmental Legislation Register (ELR). The register identifies what legislation is applicable to environmental management at a Namibian uranium mine and refers to the relevant sections in these various pieces of legislation. A summary of the legislation covered in the ELR is provided in Appendix B.

A.4.1 Permits

The list of certificates that have been granted to LHU are listed in the introduction (Section A.1). Other Environmental Permits have been identified by LHU. These Permits / Authorisation are summarised in Table A.4. The originals and copies of these documents are kept onsite.

Table A. 4: LIST OF PERMITS OR CERTIFICATES

Permit / certificate	Regulator
Mining Licence	MME
ECC	MEFT
Purification or discharge of wastewater or dirty water	MAWLR
Water abstraction permit	MAWLR
Licence for explosives magazine	MME / Namibian Police
Explosive packaging burning permit	MME
Picking, removal of protected plants	MEFT

A.5 ENVIRONMENTAL ASPECTS AND IMPACTS BECAUSE OF LHU'S ACTIVITIES

As part of the original EIA (Softchem, 2005 and ASEC, 2005), LHU has identified the environmental aspects and potential environmental impacts. Subsequently LHU has developed an aspects-impacts register as part of the process to produce the revised EMP (LHU, 2008).

The 2009 and 2011 EIAs (Metago, 2009 and Metago 2011) cumulatively assessed the activities and facilities associated with LHU's operations as well as those associated with the proposed expansion projects. Therefore, the aspects-impacts register was updated.

The full suite of LHU's facilities and activities, associated with the construction, operation, decommissioning, and closure phases are summarized in Appendix A.

The potential impacts on the environment that were previously identified and assessed can be summarized as follows:

- Human (3rd party) and animal health and safety impacts.
- Disturbance / destruction of vertebrates, invertebrates and or vegetation.
- Loss of soil resources and functionality.
- Loss of ecosystem functionality.
- Surface water pollution.
- Groundwater pollution.
- Air pollution.
- Nuisance impacts.
- Loss of natural resources - Impacts on 3rd parties.
- Impacts on tourists (tourism) / visitors to the Namib Naukluft National Park.
- Disturbance / destruction of archaeology, resources and landscapes.
- Impacts on the regional economy and the Namibian economy.
- General social impacts.
- Social well-being impacts.

To manage the above-mentioned aspects and potential impacts, LHU, with the assistance of Metago, developed a range of MMPs which are presented (and updated) in Section B of this EMP.

LANGER HEINRICH MINE
ENVIRONMENTAL MANAGEMENT PLAN

SECTION B

MANAGEMENT AND MITIGATION PLANS (MMPS)

B.1 MANAGEMENT AND MITIGATION PLANS (MMPS)

The management and mitigation plans (MMPs), listed in the table below, are applicable to the all the activities and facilities of LHU. (The MMPs follow in the subsequent sections).

Table B. 1: Various MMPs and numbers

Number	Management and Mitigation Plan (MMP)
B.1.1	Stakeholder Consultation/Communication MMP
B.1.2	Safety and Security MMP
B.1.3	Biodiversity MMP
B.1.4	Rehabilitation MMP
B.1.5	Surface water/stormwater MMP
B.1.6	Groundwater MMP
B.1.7	Resource use MMP
B.1.8	Air Quality MMP
B.1.9	Soil MMP
B.1.10	Visual MMP
B.1.11	Waste Management MMP
B.1.12	Noise MMP
B.1.13	Socio-Economic MMP
B.1.14	Radiological MMP
B.1.15	Archaeology MMP

B.1.1 Stakeholder Consultation / Communication Management and Mitigation Plan

a. General stakeholder communication

Objectives

To ensure that ongoing feedback is provided on the relevant mining activities, together with feedback on the environmental management performance of the mine and that opportunity is provided for interested and affected parties to raise comments and concerns (complaints) on the same. Also, to ensure communication / engagement strategies meet the needs of stakeholders.

Actions (commitments)

Table B. 2: Actions (commitment) relating to stakeholder (including community) communication

No	Issue	Management commitment
These commitments apply to <u>all phases</u> of the mining operation		
1	Understanding who LHU's stakeholders are	Maintain and update the stakeholder register, including stakeholders' needs and expectations. Ensure that all relevant stakeholder groups are included. • A representative database would include government, employees, service providers, contractors, indigenous populations (i.e. marginalised and vulnerable groups), local communities, NGOs, shareholders, customers, the investment sector, community-based organizations, suppliers and the media.
2	Liaising with interested and affected parties at all phases in the mine life	Devise and implement a stakeholder communication and engagement strategy.
3	Cooperative working relationship with our stakeholders	As far as is feasible, fully inform identified stakeholders about LHUs activities.
4		Use appropriate communication channels to consult with / understand issues and disseminate information to the public.
5		Compile reports and feedback regularly to stakeholders using the avenues outlined in the external communication policy.
6	Managing perceptions and issues/complaints	Develop and implement a concerns / complaints (grievance) process for the public. Document all complaints in the external communications register. Investigate and respond to the complainant. Report to the public and respond to enquiries and complaints as per LHU procedure.
7	Safety of 3rd parties	Through appropriate communication and inductions, provide information to educate third parties about the dangers associated with hazardous excavations and infrastructure.
8	Monitoring	Consider changes in the communities of interest.
9		Develop criteria for monitoring the performance of its stakeholder engagement and communication strategies as well as relations between the company and its stakeholders.
10	Biodiversity planning	Involve stakeholders during all phases of biodiversity planning (namely planning, implementation, monitoring and review).
11		Develop biodiversity awareness for all LHU employees.

No	Issue	Management commitment
12	Reporting to stakeholders	Report to MME and MET on tailings management, non-mineralised waste management, mineral waste management, and other relevant environmental aspects.
13		Report annually to DWA on tailings management, and other relevant water-related aspects as stipulated in the permit.
14		In the event of a major (e.g. seepage) or catastrophic (e.g. failure) incident associated with a TSF, report immediately to DWA, MME and MEFT.
15		Report regularly to society by means of sustainability reporting.
16		Reporting to stakeholders (Paladin Energy Limited, and public) on relevant environmental related matters.

B.1.2 Safety and Security Management and Mitigation Plan

a. General (third party) safety and security

Objectives

The objective of the management measures is to prevent physical harm to third parties and animals from potentially hazardous excavations and infrastructure.

Actions (commitments)

Table B. 3: Actions (commitments) relating to general (third party) safety and security

No	Issue	Management commitment
These commitments apply to construction, operation and decommission phases		
1	Access of unauthorised people to the ML.	All warning signs (on the eastern ML boundary and on the western access road) will be maintained. The current security control point will prevent uncontrolled vehicle access to existing and future mining, stockpile and waste facility areas.
2	Emergency	If people do fall off or into hazardous excavations or infrastructure causing injury, or if any mineralised waste facilities fail causing injury to people, the LHU emergency response procedure will be followed.
These commitments apply to operation and decommission phases only		
3	Safety risks	Open pit backfilling operations will take the possibility of surface settlement into account. This requires compaction of backfilled material. Final replacement of topsoil onto the backfilled overburden / waste rock material will be done with the understanding that if settlement occurs thereafter, the stripping of topsoil and additional backfilling with overburden / waste rock will be required. Thereafter the topsoil will have to be replaced.
4		The permanent aboveground waste facilities and other stockpiles will be designed, constructed and operated in a manner that stability is a priority, that flood protection is provided and that the risk of failure is limited to acceptable levels.
5		Permanent aboveground mineralised waste facilities and stockpiles will be closed in a manner that they present landforms that have similar safety attributes to the natural landforms in the area. In this regard, structures will be stable, protected from flood damage, and steep slopes will be contoured where possible.
6		If any voids remain open, the area will be made safe to ensure that there is no risk to the safety of people and animals.
7	Old exploration shafts	As far as possible, identify the old exploration shafts and fence these off.
8	Blasting	Fly rock is contained within 700m of the blast site
9		Prior to each blast the blast area will be cleared of 3rd parties to a safe distance determined by appropriate legislation and Safe Working Procedures. Prior to each blast an audible warning will be sounded.
10		All registered complaints will be documented, investigated and efforts made to address the area of concern where possible.

b. Occupational Health and Safety

Occupational health and safety aspects fell outside the Scope of the EIA process completed and are not included in this EMP. LHU has implemented a formal Health and Safety management system.

B.1.3 Biodiversity Management and Mitigation Plan

a. Physical destruction of biodiversity

Objectives

The objective of the management measures is to prevent or limit the unacceptable loss of biodiversity and related functionality through physical disturbance. Given that the main components of the mining project are already approved and implemented, there may be some difficulty in achieving this objective, although there is still opportunity to plan for those sections of the mine that are yet to take place.

Actions (commitments)

Table B. 4: Actions (commitments) relating to the physical disturbance of biodiversity associated with the water pipeline and powerline to the Swakop River

No	Issue	Management commitment
These commitments apply to the <u>construction phase only</u>		
1	Degradation of habitat associated with new powerline	**Minimise**: • Limit disturbance to vegetation (particularly in rocky areas and washes) by keeping to existing tracks, minimising turning circles and keeping disturbance around workplaces to a minimum. • Avoid excavations and trenches. • As far as possible, lay the powerline aboveground – either within a sleeve or on standard poles – as near as possible to the existing pipeline. • Send environmental officer out ahead of the working team to establish where the work can be done, thus ensuring that work is not done on sites occupied by rare and protected plants. Large bushes and trees are to be left undisturbed (unless they are dead and do not provide special habitat for animals). **Mitigation:** • Implement the LHU land disturbance procedure which outlines what needs to be done prior to the disturbance of sensitive areas. This includes the removal of protected plants, prior to construction. • Ensure regular monitoring by an environmental officer to ensure contractors minimise disturbance footprint and that all concrete and hydrocarbon spills are removed as soon as practically possible. • Rehabilitate all areas disturbed during the construction phase immediately once construction is completed.
2	Degradation of indigenous vegetation	**Avoid:** Prevent damage to large bushes, shrubs and indigenous trees such as Ana trees and camelthorns. **Minimise:** As far as possible, prevent damage to indigenous trees such as Tamarisk and mustard bush. **Mitigate**: If destruction of large bushes, shrubs and indigenous trees, that are protected, is unavoidable, obtain the relevant permits before removing the specimens. Permits for the removal of protected plants are obtained from the Department of Forestry and the National Botanical Resource Institute (NBRI).
3	Infestation by alien invasive plants (e.g. Prosopis, Tamarisk hybrid and wild tobacco)	**Mitigate and monitor:** Ensure that alien invasive plants do not establish in areas disturbed by LHU's activities. If seedlings are detected, they are to be removed. As part of the water abstraction permit conditions and best practise, develop an alien invasive eradication programme for the abstraction area in conjunction with MEFT and DWA

No	Issue	Management commitment
4	Illegal collection of rare and endangered plants and wildlife	**Mitigate:** Ensure that an environmental officer is onsite during the construction and decommissioning phases to ensure that illegal collection of plants by contractors does not take place.
5	Birds may be killed or injured by colliding with powerline infrastructure	**Minimize:** In case an aboveground sleeve is preferred for laying the powerline, the possibility of injuries and or killing of birds is minimized **Mitigate and monitor:** LHU staff should monitor the track and powerline for potential problem areas and incidents must be reported. Reporting procedures must be clarified. Bird nesting activities must be discouraged, and such activities must be managed in collaboration with MEFT. Nests must be removed when acceptable. If electrocutions remain a problem, the relevant sections must be retro-fitted with mitigation, by way of adaptive management.
These commitments apply to the operational phase only		
6	Degradation of habitat due to formation of tracks (maintenance of pipeline and powerline)	**Minimise:** Limit the number of tracks made by operations personnel to access the water line. This should include rehabilitating a number of the tracks that have already been made to access the pipeline at different points along the route. **Mitigate:** During decommissioning phase ensure that the tracks are rehabilitated in accordance with the methodology prescribed in the restoration plan.
7	Increased erosion and subsequent alteration in water runoff and loss of valuable soils	**Monitor:** LHU staff should monitor the track and pipeline for signs of erosion and if identified these areas should be rehabilitated. **Mitigate**: Limit the number of tracks made by operations personnel to access the water pipeline and powerline. Personnel should use the existing track or park at designated lay-bys and walk to the section of the lines needing repair.
8	Pollution of soils and water quality Operation of diesel generators and pumps at the three production boreholes	**Avoid:** The potential pollution of soils and water by hydrocarbon pollution can be avoided by choosing powerline option. **Minimise** potential for pollution by building proper concrete bunds for diesel generators. **Mitigate** for potential pollution by regularly inspecting and maintaining equipment and cleaning up spills immediately according to LHU's hydrocarbon spillage procedure.
These commitments apply to all phase		
9	Illegal collection of rare and endangered plants and wildlife	**Mitigate:** Try and control access on the road leading to the Swakop River by erecting signboards and if necessary, reporting sightings of uncontrolled vehicles to MEFT.
10	Illegal collection of firewood	**Minimise:** In order to try and decrease the likelihood of people accessing this remote section of the Swakop River, reduce the number of roads and tracks leading there, and try and make them inconspicuous from main roads. **Mitigate:** The mine could play their role in helping to manage this risk by making motorists aware of hazards associated with the mining activities and reporting to MEFT where relevant.

Table B. 5: Actions (commitments) relating to the physical disturbance of biodiversity associated with all other mining and processing related activities within the mine lease

No	Issue	Management commitment
These commitments apply to the design phase		
1	Loss or degradation of habitat for vegetation communities (including loss of soils and permanent loss of rare and protected vegetation)	Design footprints of all facilities as small as possible and generally limit mine infrastructure, activities and related disturbance to those specifically identified and described in the EIA reports.
2		Use existing servitudes as far as possible, clearly mark the access tracks to be used and designate turning points, use existing disturbed areas where possible for installation purposes and avoid drainage lines as much as possible and where unavoidable conduct operations as carefully as possible
3		WRD location to be inline with that proposed in the Stage 4 EIA Report.

No	Issue	Management commitment
These commitments apply to the <u>construction phase</u>		
4	Loss or degradation of habitat for vegetation communities (including loss of soils and permanent loss of rare and protected vegetation)	Mark out all construction footprints and clearly convey the rule of staying inside these boundaries to all construction crews.
5		Raise environmental awareness amongst workers.
6		Develop a road use policy for construction period and enforce through regular checks, all vehicles should drive slowly and speed limits must be enforced.
These commitments apply to <u>all phases</u>		
7	Loss or degradation of habitat for vegetation communities (including loss of soils and permanent loss of rare and protected vegetation) associated with **infrastructure at process plant**	**Minimise** The "Reid" wash located to the south of the process plant will not be blocked or polluted and infrastructure such as dumps and stockpiles will not be placed in the wash. **Mitigate:** Ensure that there are patches of schist left intact, located in close proximity to the plant. This will facilitate restoration of the area at mine closure.
8	Loss or degradation of habitat for vegetation communities (including loss of soils and permanent loss of rare and protected vegetation) associated with **construction of utility servitudes (pipelines, powerlines, roads**	**Minimise** • Minimise damage to the washes. In particular ensure that flow is not impeded by the road. • Ideally the sections of pipelines crossing the main washes should be placed underground so as not to impede water flow (or be damaged from flash floods) and to allow animal movement through the wash.
These commitments apply to the <u>operations, decommissioning and closure</u>		
9	Destruction of hydrology	**Minimise** As far as possible avoid total destruction of the hydrology of the Gawib by keeping certain sections of the riverbed intact (e.g. those areas with the greatest stands of camelthorns) and ensuring that opportunities for restoration of mined-out pits commences during the operations phase. **Mitigate** Restore the hydrological regime (shallow and deep) at mine closure so that recharge of the system can occur and so that water will again flow through the Gawib channel. Refer to Groundwater (MMP B.1.6)
10	Separation of upstream and downstream systems (i.e. source areas, seepage lines and drainage corridors) associated with **mine pits**	**Minimise**: • It is recommended that all efforts be made to stay out of the vegetation community No 4.1 and 4.2 (*Acacia erioloba - Stipagrostis damarensis* on sandy washes and rivers and terraces), and the large washes thus ensuring that water can always flow through this main Gawib channel. • This will involve redesigning the shape of the pit at a number of places and ensuring that waste dumps and stockpiles locations are carefully designed within these areas. If necessary, servitudes such as powerlines or waterlines could be placed in these areas as it will not interfere with water flow. Of course, flash floods might interfere with these servitudes. • Once the temporary TSF has been removed and once mining of the area commences all efforts should be made to keep the wash northeast of this facility open. **Mitigate** Where areas must be disturbed, restore the hydrological regime (surface, shallow and deep) progressively towards mine closure so that recharge of the system can occur and so that water will again flow through the Gawib channel.

No	Issue	Management commitment
11	Separation of upstream and downstream systems (i.e. source areas, seepage lines and drainage corridors) associated with **permanent TSFs**	**Mitigate** • As part of the progressive rehabilitation, ensure that the TSFs are restored in such a way that water falling on these facilities are able to drain into the main washes and thus feed downstream users. • Ensure that artificial dams are not created in the blocked tributaries on the upstream sides of the TSFs. This water should be diverted around the TSFs and allowed to join up with a tributary that can take the water downstream of the ML, thus avoiding the creation of permanent pools.
12	Separation of upstream and downstream systems (i.e. source areas, seepage lines and drainage corridors) associated with **WRDs**	**Avoid** placing permanent structures in extended washes or at the mouths of extended washes. **Mitigation** • Measures have been put in place for these facilities, including diversion of clean stormwater away from these facilities during the operations phase. • Diversion of water from the WRDs should be considered as part of rehabilitation planning to ensure that these structures do not erode, thereby transporting waste material into restored or undisturbed areas and undermining the stability of the dumps. • The waste dumps on the schists are located in “blind” washes, meaning washes that do not extend beyond the ML. As part of the progressive rehabilitation, these dumps must be restored in such a way that they do not erode and that water flows off them into the adjacent tributaries.
13	Loss or degradation of habitat for vegetation communities (including loss of soils and permanent loss of rare and protected vegetation) associated with **mine pits and associated structures**	**Avoid** There are a number of places where the proposed pits intersect irreplaceable and highly sensitive vegetation communities. All efforts must be made to avoid mining in these areas by considering alternate designs during LOM planning. In particular all efforts should be made not to mine the camelthorn forests (vegetation community 4.1 and 4.2) and the granite koppies located on the eastern side of the ML (vegetation community 1.2). **Minimise** LHU must strive to minimise its disturbance footprint. During LOM and Mine Closure Planning ensure that certain patches of all vegetation types affected by mining are identified and set aside as conservation areas. These patches will act as important sources of resources for restoration. They can also act as surrogate nurseries for transplanted shrubs and bulbs, and as comparison sites against which to compare restoration success. **Mitigate**: • Before opening up a new pit ensure that the LHU Land Disturbance procedure is followed. The environmental team must be given enough time to apply for permits to remove plants (if necessary), geophyte bulbs, and topsoil. • Obtain permits to remove protected plants from the Department of Forestry and the NBRI – where relevant. • Restoration research should commence as early on in the LOM as possible so that progressive restoration of mined-out areas, that have been filled-in with tailings or waste rock can take place. As very little is known about the restoration of arid systems, an early start will also allow the mine to investigate the most appropriate approaches. • Delineate the proposed area to be disturbed, to relocate species effectively (especially species of conservation concern) (First assess usefulness of plant rescue and translocation operations by consulting the relevant experts and implement such a programme if deemed necessary and of low risk); • Monitor the success of translocated plants and rehabilitation; • Where relevant (where restoration is not an option), investigate offsets relating to the residual impacts arising from the disturbance. • LHU will partner with conservation organisations (e.g. Gobabeb and Parks and Wildlife) to effectively manage their biodiversity impacts (both direct and indirect).

No	Issue	Management commitment
14	Loss or degradation of habitat for vegetation communities (including loss of soils and permanent loss of rare and protected vegetation) Associated with **permanent TSFs**	**Mitigate**: • Restoration research to commence early in the LOM, to establish the final shape, topsoil and other requirements needed to create a functioning ecosystem that is as similar to the pre-mining environment as possible. • Mined-out pits should be filled-in and restored as soon as practically possible.
15	Loss or degradation of habitat for vegetation communities (including loss of soils and permanent loss of rare and protected vegetation) associated with **WRDs and stockpiles.**	Clearly demarcate boundaries of WRDs.
16		As part of closure planning, the designs of any permanent structures will take into consideration the requirements for the establishment of long-term biodiversity functionality, aftercare and confirmatory monitoring.
17	Loss or degradation of habitat for vegetation communities (including loss of soils and permanent loss of rare and protected vegetation) associated with **topsoil stockpiles.**	**Avoid and minimise**: When looking for sites for topsoil stockpiles, avoid areas with highly sensitive or irreplaceable ratings. If this is impossible, determine how best to mitigate the impacts associated with developing in these areas.

b. Reduction of water resources as an ecological driver

Objectives

The objective of the management measures is to prevent the unacceptable loss of biodiversity and related functionality through a reduction in the key ecological drivers of groundwater and temporary surface water flow.

Actions (commitments)

Table B. 6: Actions (commitments) relating to the reduction of water resources as an ecological driver associated with the water pipeline upgrade to the Swakop River

No	Issue	Management commitment
These commitments apply to the <u>operational phase only</u>		
1	Decreases in the level of the water table / over-abstraction the groundwater aquifers	**Mitigate and monitor:** In line with the permit, restrict water abstraction from the Swakop River to 500 000m^3 per year. Monitor the groundwater levels.

Table B. 7: Actions (commitments) relating to the reduction of water resources as an ecological driver associated with all other (mining and processing) activities within the mine lease

No	Issue	Management commitment
These commitments apply to the <u>design phase</u>		
1	Decreases in the level of the water	Downstream users are considered when designing all facilities
2		The infrastructure footprint is minimised

No	Issue	Management commitment
3	table, due to prevention in recharge.	Ensure long-term designs for WRDs and allow for the diversion of surface water to maintain natural downstream flow paths.
These commitments apply to the operational, decommissioning and closure phases		
4	Decreases in the level of the water table, due to prevention in recharge.	**Minimise** As far as possible avoid total destruction of the hydrology of the Gawib by keeping certain sections of the riverbed intact (e.g. those areas with the greatest stands of camelthorns) and ensuring that restoration of mined-out pits commences during the operations phase.
5		**Mitigate** Clean surface water diversion measures are provided around infrastructure and activities so that not all clean surface water flow is restricted / captured by mining infrastructure. Given physical geographical constraints, it is not possible to divert clean run-off around the mine and plant infrastructure in the centre of the ML. As part of ongoing mine rehabilitation, care will be taken to re-establish functioning subsurface layers and associated aquifers as soon as possible after mining is completed in the various sections. Refer to Groundwater (MMP B.1.6)
6	The introduction of large water bodies in a hyper-arid area (**evaporation ponds and TSFs**)	Prevent access to the evaporation ponds by erecting 1.5 m high 5 strand fences, set back at least 5 m from the pond edge, around the entire circumference of the ponds. Similarly, erect 1.5 m high 5 strand fences around TSFs where relevant to prevent animals from entering the facilities.
		Use bird scaring devices (e.g. automated bird scarers) to prevent birds settling.
		Remove of any vegetation associated with the evaporation ponds to prevent an artificial ecosystem developing.
		Monitor the presence of animals, birds and insects at the evaporation ponds and TSFs at regular intervals and note evidence of mortality or morbidity.

c. Managing general disturbance

Objectives

The objective of the management measures is to prevent disturbance to biodiversity.

Actions (commitments)

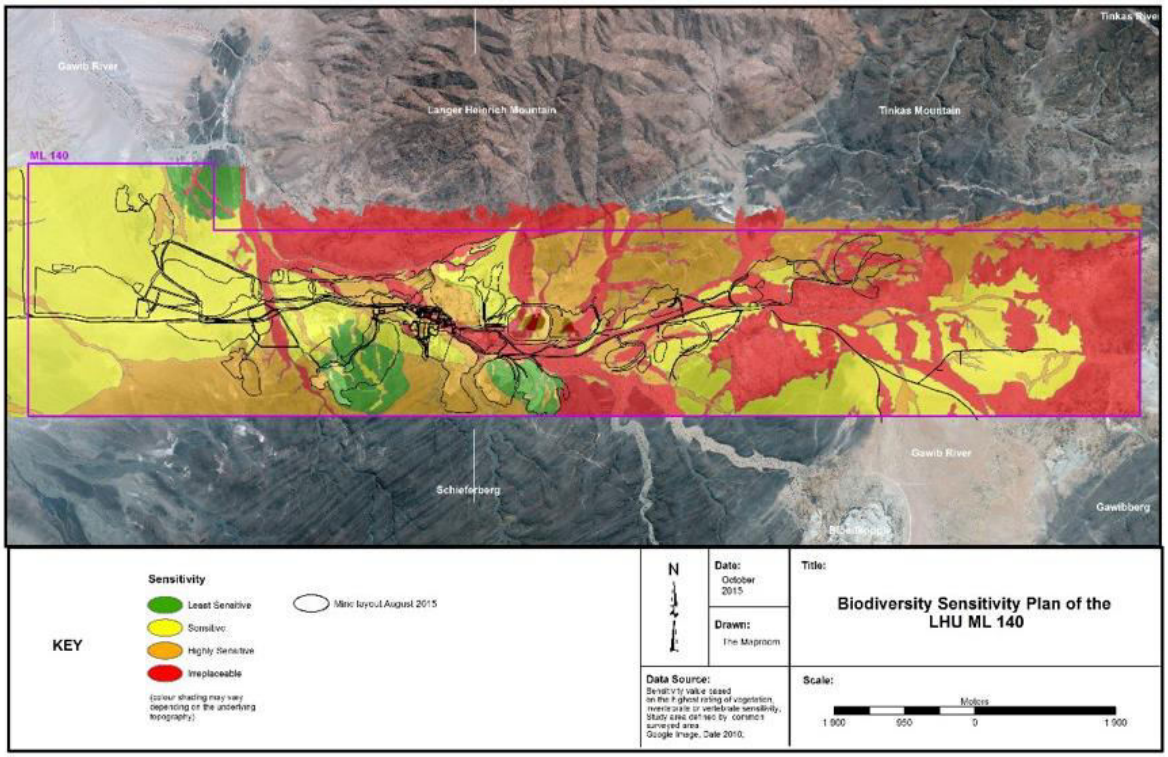
Table B. 8: Actions (commitments) relating to the general disturbance to biodiversity

No	Issue	Management commitment
These commitments apply to all phases		
1	Infestation by alien invasive plants (e.g. Prosopis, and wild tobacco)	**Mitigation:** Remove the existing Prosopis trees, using well tested Prosopis removal techniques (physical and chemical treatment) Monitor the mine lease and if infestation is noted (particularly adjacent to water lines) organise to have the seedlings removed.
2	Permanent loss of protected and rare plant species as a result of planned removals	**Avoid:** During the pre-construction phase, establish conservation areas that will protect certain populations of protected or rare trees and plants throughout the LOM. **Mitigate:** • Prior to opening up a new (previously undisturbed) area, ensure that that the LHU Land Disturbance procedure is followed. The environmental team must be given enough time to apply for permits to remove plants (if necessary). • Obtain permits to remove protected plants from the Department of Forestry.

No	Issue	Management commitment
3	Permanent loss of protected and rare plant species as a result of illegal collection	**Mitigate:** • As far as possible, keep people out of the irreplaceable areas. • Ensure that an environmental officer monitors construction, operational and decommissioning activities being undertaken in areas close to vulnerable sites to reduce the opportunity for illegal collection. • Monitor vulnerable plant populations over time, to ensure that illegal collection is not taking place. The sites to be monitored should be indentified in conjunction with the vegetation specialist. • Conduct periodic inspections to ensure that illegal plants are not being removed.
4		Limit mine infrastructure, activities and related disturbance to those specifically identified and described in the EIA report (Metago, 2011).
These commitments apply to <u>construction and operations only</u>		
5	Monitoring LHU's impact on biodiversity and rehabilitation progress	Conduct baseline studies of the selected indicator group (e.g. wasps of the family Pompilidae) in the main habitat types that will suffer direct impacts. For each habitat type an area within the direct impact zone and a control area outside of this zone should be selected and surveyed.
6	Managing contractors	Occupants of the drillers' camp will remain within the camp after working hours
These commitments apply to <u>construction, operation and decommissioning</u>		
7	Minimising negative impacts on biodiversity	• Limit disturbance to vegetation (particularly in rocky areas and washes) by making use of existing disturbed areas as far as possible. • Try and control access on the road leading to the Swakop River by erecting signboards, making them aware that it is a restricted area and if necessary reporting them to MEFT.
8		• The location of the isolated windblown sand patch (southwest of the plant) must be incorporated into the GIS land use plan. Disturbance of this area must be avoided as zero potential exists to restore this area as part of the progressive rehabilitation. • Ensure that the use of light is kept to a minimum and where it is required, yellow lighting is used, and vertebrates are kept away from the area around the lights with appropriate fencing. • Ensure that there is zero tolerance of killing or collecting any biodiversity. • Ensure that strict speed control measures are used for any vehicles driving within the Namib Naukluft National Park boundary. • Ensure that dust control measures included in the Air Quality MMP are implemented. • Ensure that pollution prevention measures are implemented. • Ensure guidelines and rules are regularly communicated to workers and visitors and this is enforced with appropriate signage; • Rigidly enforce no hunting and no collecting policies and regularly inspect construction sites for these purposes; • Only allow construction and mining personnel and authorised visitors onsite; • Measure species composition and diversity in areas around proposed works before, during and after impacts, report and publish findings.
9	Monitoring / auditing of activities	• Conduct regular monitoring and periodic checks on the following: the footprint being disturbed by contractors, whether the relevant MMPs are being implemented, that illegal plants are not being removed. • Ensure that an environmental officer monitors construction, operational and decommissioning activities being undertaken in areas close to vulnerable sites to reduce the opportunity for illegal collection. • Monitor vulnerable plant populations over time, to ensure that illegal collection is not taking place. The sites to be monitored should be indentified in conjunction with the vegetation specialist.
These commitments apply to <u>operation and decommissioning</u>		
10		Where possible, wildlife corridors should be maintained during LOM and restored during decommissioning.

No	Issue	Management commitment
11	Minimising negative impacts on biodiversity	Granite koppies should be cleared of mine activities so that hydrological and ecological functioning can resume. Restoration of these koppies at decommissioning, if disturbed, is limited.
12		As far as possible, maintain a 50 m border zone around granite koppies and 20 m border zone around the schists.
13		Where ephemeral pools will be disturbed by mining operations, these pools should be re-established at a nearby alternative site in consultation with ecological specialists.
14	Monitoring LHU's impact on invertebrates and rehabilitation progress	• Regular monitoring (preferably annually), by repeat surveys of the control sites at the same time each year for life of the mine, to provide a measure of naturally occurring inter-annual variation so that this can be distinguished from mining-related impacts and rehabilitation progress. • Monitoring could be done either through capture-identify-release methods or visual counts of individuals along a transect. • Continued monitoring of both the control sites and the rehabilitated areas after mining operations have ceased until mine closure. Repeat surveys should be carried out annually for at least the first three years post-rehabilitation, after which the frequency may be reduced, initially to every second year and then every 3-5 years until rehabilitation targets have been reached.
15		Study the zebras' movements across the region to understand their relationship to disturbance and water (depending on findings consider the provision of artificial water sources provided it is tightly managed and closely monitored for effects on other species)
16	Alien / invasive / weed management programme	• Implement an alien / invasive / weed management programme for the LHU site including abstraction sites in line with the water abstraction permit conditions and in conjunction with MEFT and the Department of Water Affairs (DWA). • Ensure that alien invasive plants do not establish in areas disturbed by LHU's activities. If seedlings are detected, they are to be removed. Care will be taken to prevent the encroachment of these species into rehabilitated areas. • The alien /invasive / weed management programme will include the removal of existing Prosopis trees, using the well tested Prosopis removal techniques (physical and chemical treatment); monitor the mine lease and if infestation is noted (particularly adjacent to water lines) organise to have the seedlings removed.
17	Rehabilitation of damaged ecosystems	Develop a rehabilitation plan based on a technique that will allow local biodiversity to re-establish as part of a natural landscape functioning process. Test techniques and modify accordingly.
18		Plan restoration of mine pits, WRDs, TSFs and evaporations ponds and implement rehabilitation activities as soon as is practicable in consultation with the relevant experts.
19		The team that develops the rehabilitation and restoration plan should be multi-disciplinary and should include environmental engineers to ensure that issues such as erosion (surface and subsurface) are considered in the final design.
20		Rehabilitation of disturbed areas in line with the rehabilitation and restoration plan should take place as soon as is practically possible.
21		Restore the hydrological regime (shallow and deep) at mine closure so that recharge of the system can occur and so that water will again flow through the Gawib channel.
22	Offsetting residual biodiversity impacts	If necessary, undertake a systematic assessment of potential offsets and determine and identify appropriate options for LHU. Where irreplaceable biodiversity will be lost, a biodiversity offset will be investigated and where required be implemented.

Figure B. 1: Ecological Sensitivity Map



d. Biodiversity monitoring

The monitoring program will include:

- Areas set aside as conservation areas will be monitored on a weekly basis during construction and a monthly basis thereafter to ensure that no disturbance occurs.
- Where areas are to be disturbed and later restored, a representative control site (an area of similar biodiversity attributes that will not be disturbed) will be monitored, by an appropriately qualified specialist, across sufficient seasons to establish restoration targets that take seasonal variation into account. The targets will be set in consultation with MEFT (Parks and Wildlife). Once the targets are defined, these will be used to determine the success of restoration. As an example, a relevant invertebrate target is the re-establishment of an indicator group such as the wasps of the family Pompilidae, because these wasps will only exist where the necessary components of the ecosystem have been established.
- Monitoring of the rehabilitated areas will continue seasonally until the rehabilitation targets have been reached and there is no possibility of further disturbance by mining activities.
- Monitoring could be done either through capture-identify-release methods or visual counts of individuals along a transect.

The monitoring programme will also include:

- Regular inspections to ensure that the land disturbance procedure is being implemented, as required. The results of the inspection will be incorporated into LHU's EMS.
- Regular monitoring and periodic checks on the following: the footprint being disturbed by contractors, whether the spillage management programme is being implemented, that biodiversity is not being unlawfully removed from the area.
- Conduct periodic surveys in adjacent undisturbed areas to monitor the status of species of conservation concern, such as: *Lithops gracilidelineata, L.ruschiorum, Aloe namibensis, Larryleachia marlothii, Hoodia currorii, Commiphora saxicola, C. Virgata, C. glaucescens*; and
- Keep comparable records of animals of conservation interest including sand lizards, snakes and Hartmann's mountain zebra.
- Monitor zebra and all other large mammals annually as they move through the eastern parts of the ML, to commence in advance of the construction of the eastern evaporation pond.

Reporting will be undertaken at regular intervals (at least bi-annually) during operations.

B.1.4 Rehabilitation / Restoration Management and Mitigation Plan

a. Disturbed areas to be rehabilitated

Objectives

To successfully rehabilitate all disturbed areas relating to the mining activities ensuring:

- Geological layers are reconstructed in such a way to (as far as possible) imitate pre-mining conditions so as to prevent unacceptable loss of biodiversity and related functionality through a reduction in the key ecological drivers of water flow.
- To ensure that the placement of soil achieves post-closure land use objectives.
- Ensure that rehabilitation of landscapes is accommodated for in the mine closure plan.
- To determine the effectiveness of rehabilitation measures.

Actions (commitments)

Table B. 9: Actions (commitments) relating to rehabilitation

No	Issue	Management commitment
These commitments apply to operation only		
1	Understanding biodiversity	Restoration research through trial runs, etc. should commence as early on in the LOM as possible so that progressive restoration of backfilled areas, WRDs, stockpiles, etc. can take place. As very little is known about the restoration of arid systems, an early start will also allow the mine to investigate the most appropriate approaches.
2		Consider the use of borrow pits for trial restoration methods.
3	Monitoring LHU's impact on biodiversity and rehabilitation progress	Rehabilitation targets must be set in consultation with MEFT (Parks and Wildlife).
4		Modification of initial rehabilitation targets may be necessary if high inter-annual variation in control site data is encountered; this should be done in consultation with MEFT (Parks and Wildlife).
These commitments apply to operation and decommissioning		
5	Rehabilitation of disturbed land: restoration of soil utilisation	Stockpiled soil will be used to rehabilitate disturbed sites either ongoing as disturbed areas become available for rehabilitation and or at closure.
6		A representative sampling of the stripped soils will be analysed to determine the nutrient status of the utilizable material. As a minimum the following elements will be tested for: EC, CEC, pH, Ca, Mg, K, Na, P, Zn, Clay % and organic matter content. These elements provide the basis for determining the fertility of soil. Based on the analysis, fertilisers will be applied if necessary.
7		The stockpiled utilizable soil (as far as possible 500 mm) shall be redistributed in a manner that achieves an approximate uniform stable thickness consistent with the approved post-mining land use and will attain a free draining surface profile. A minimum layer of 300 mm of soil will be replaced where relevant.
8		Erosion control measures will be implemented to ensure that the topsoil is not washed away and that erosion gullies do not develop prior to vegetation establishment.
These commitments apply to operation, decommissioning and closure		
9		Mined-out pits should be filled-in and restored as soon as practically possible.

No	Issue	Management commitment
10	Rehabilitation of mined-out areas	Develop and implement a backfilling procedure that caters for the use of overburden, tailings or a combination of both, subsidence above backfilled areas and restoration of geological layers and associated aquifers.
11		Open pit backfilling operations will take the possibility of surface settlement into account. This requires compaction of backfilled material where required. Final replacement of topsoil onto the backfilled overburden / waste rock material will be done with the understanding that if settlement occurs thereafter, stripping of topsoil and additional backfilling with overburden / waste rock will be required. Thereafter the topsoil will have to be replaced.
12		Care will be taken to re-establish functioning subsurface layers and associated aquifers as soon as possible after mining is completed in the various sections.
13		Recreate the paleo-channel aquifer so that aquifer flow can continue, and that blocked water does not move up through the tailings deposition zone and seep pollution into the more permeable shallow alluvial aquifer.
14		In cases where mined-out areas are immediately beneath the current main channel of the Gawib River, backfilling will allow for a top layer made of alluvial sand and gravel, stockpiled when stripping surface layers at mining start. The layers overlying the tailings (waste rock / alluvial sands) have to be thick enough to prevent erosion and potential exposure of tailings after flood events in the river aquifer.
These commitments apply to closure only		
15	Managing of borrow pits on the mine lease	Ensure that final rehabilitation of the borrow pits is undertaken once all the borrow material has been removed.
These commitments apply to decommissioning and closure only		
16	Rehabilitation of landscapes at mine closure	Develop a rehabilitation plan to ensure that the visual impacts are minimised and as far as possible, original landscapes including original river elevations are reinstated (appearance and function) and that any residual landforms will be contiguous with the surrounding topography and of low erodability.
17		In the shaping of any structures that will remain after closure, harsh, angular and steep slopes will be avoided and care should be taken to integrate these structures into the surrounding landscape
18		Permanent aboveground waste stockpiles will be rehabilitated and closed in a manner that they present landforms that have similar safety attributes to the natural landforms in the area. In this regard, structures will be stable, protected from flood damage, final voids will be backfilled and steep slopes will be contoured. If any voids remain due to the fact that there is not enough backfill material, the area will be made safe to ensure there is no risk to people and animals' safety.

Also, refer to the Biodiversity MMP (MMP B.1.3) for specific rehabilitations actions required in terms of biodiversity.

B.1.5 Surface water / Stormwater Management and Mitigation Plan

a. Altering drainage patterns and stormwater management

Objectives

The objective of the management measures is to prevent the unacceptable loss of biodiversity and related functionality through a reduction in the key ecological drivers of surface water flow. Also, to minimise mixing of clean and dirty water systems and to minimise seepage into mining areas downstream thereby hampering mining.

Actions (commitments)

Table B. 10: Actions (commitments) relating to the altering of drainage patterns and stormwater management.

No	Issue	Management commitment
These commitments apply to the <u>design phase</u>		
1	Natural flow of stormwater flowing from surrounding areas into and around the operations	Design all stormwater interventions in such a way that stormwater flowing from the upper reaches of the Gawib can bypass the major structures such as the TSFs and the WRDs and low-grade stockpiles.
These commitments apply to <u>construction and operation</u> only		
2	Natural flow of stormwater (clean and dirty) flowing from surrounding areas into and around the operations	Damage to the washes should be minimised. In particular if roads are constructed, ensure that flow is not impeded by the road. This is of particular importance across the Reid wash. This will prevent artificial pooling of water. Ideally the sections of pipelines crossing the main washes should be placed underground so as not to impede water flow (or be damaged from flash floods) and to allow animal movement through the wash.
3	Flow of dirty stormwater (rainwater that falls onto and flows across the site)	Construct engineered structures to direct contaminated water from the processing areas, roads and offices areas to the chosen stormwater control mine pit or the process pond / process circuit for storage and re-use.
4	Use of pit/s as storage dams during flood events	Carry out stability assessments of pit walls to accommodate flood events / high water table and investigate downstream conditions to identify potential risks, if any. Assess best option to deal with risk e.g. dewatering or compacted cut off
These commitments apply to <u>operation and decommissioning</u> only		
5	Natural flow of stormwater (clean and dirty) flowing from surrounding areas into and around the operations	In the event of a flood, ensure suitably sized pumps are available to dewater mine pits quickly in case that the water quality was tested and approved for discharge into downstream drainage. Where pits F and C contain polluted surface and/or groundwater and runoff water cannot be discharged quickly, the mine will use that water in the process during operations.
6		Ensure existing sumps to capture seepage operate optimally.

No	Issue	Management commitment
These commitments apply to the operational, decommissioning and closure phases		
7	Decreases in the level of the water table, due to over abstraction the groundwater aquifers or prevention in recharge.	**Mitigate** Clean surface water diversion measures are provided around infrastructure and activities so that not all clean surface water flow is restricted / captured by mining infrastructure. Given physical geographical constraints, it is currently not possible to divert clean run-off around the mine and plant infrastructure in the centre of the mine lease. However, after mine closure, the natural flow of the Gawib River and its tributaries need to be restored also in these areas. As part of ongoing mine rehabilitation, re-establish functioning subsurface layers and associated aquifers as soon as possible after mining is completed in the various sections.
8	Natural flow of stormwater	As far as possible avoid total destruction of the hydrology of the Gawib by keeping certain sections of the riverbed intact (e.g. those areas with the greatest stands of camelthorns) and ensuring that restoration of mined-out pits commences during the operations phase.
9		Once the temporary TSF (TSF1) has been removed and once mining of the area commences all efforts shall be made to keep the drainage lines north of this facility open.
10		Review and updated the Site-wide Storm Water Management Plan.

b. Pollution of surface water - general

Objectives

The objective of the management measures is to prevent pollution of surface water run-off.

Actions (commitments)

Table B. 11: Actions (commitments) relating to the pollution of surface water – general

No	Issue	Management commitment
These commitments apply to design, operation and closure phases		
1	Clean and dirty water	Where possible, surface water management facilities and other surface infrastructure will be designed, constructed and operated so that dirty water is kept separate from clean water run-off through a system of berms, channels, trenches, flood protection measures, erosion protection or dams. The need for long-term controls around the WRDs will be determined as part of closure planning
These commitments apply to construction and operation phases		
2	General surface water pollution/ spills	All hazardous chemicals (new and used), dirty water, mineralised wastes and non-mineralised wastes are handled in a manner that they do not contaminate surface water run-off or where this is not possible, demonstrate through monitoring that the potential contamination is within acceptable limits from a human health and related risk perspective.
3		Prevent pollution through basic infrastructure design and through education and training of workers (permanent and temporary)
4		The required steps to enable fast reaction to contain and remediate pollution incidents. In this regard the remediation options include treatment or disposal of contaminated soils as hazardous waste. The former is generally considered to be the preferred option because with successful remediation the soil resource will be retained in the correct place. The treatment options include bioremediation at the point of pollution, or removal of soils for washing and or bioremediation at a designated area after which the soils can be replaced.
5		Ensure that on-site contractors have all the necessary hazardous protection equipment for people and environment in the advent of a spill.
6		Establish and maintain concrete bunded areas around all diesel power generators, where required.
7		Maintain and implement spill management procedure, including the clean-up of hydrocarbon spills.

No	Issue	Management commitment
8		Ad hoc spills will be cleaned up / remediated in line with spillage management procedure.
9		Place spill kits in all areas where hazardous substances are dispensed and stored and train staff to use it.
10		Specifications for post-rehabilitation audit criteria to ascertain whether the remediation has been successful.
11	Separation of clean and dirty water systems	Dirty water run-off will be preferentially contained by channelling it into the mine pit and mitigation measures to prevent this water polluting the deeper paleochannel aquifer are set out the groundwater MMP.
12		Where rainfall-related discharges occur, monitor the surface water runoff quality.
13	Current infrastructure	Ensure that where current infrastructure becomes damaged or causes surface water contamination they are adequately repaired and maintained.
14	Emergency	Major spillage incidents that contaminate flood waters will be handled in accordance with the LHU emergency response procedure.
15	Training and awareness	Induct all employees and contractors in LHU's spillage management procedure.
16		Train selected staff in the remediation of soils or water contaminated by hydrocarbon spills.
17	Safe disposal and rehabilitation of hydrocarbon contaminated soils and water	Develop and implement a hydrocarbon remediation procedure that explains how to deal with the treatment of contaminated environments (soil and water).
18	Monitoring of hydrocarbon spills	Ensure that checking for hydrocarbon spills is included in the daily inspections.
19		Report spillages as per the incident management procedure.

c. Industrial effluent

Objectives

The objective of the management measures is to prevent pollution of surface water, etc. due to industrial effluent.

Actions (commitments)

Table B. 12: Actions (commitments) relating to industrial effluent.

No	Issue	Management commitment
These commitments apply to <u>operation phase only</u>		
1	Legal compliance	Adhere to the wastewater and effluent exemption permit, No. 669, which was issued by DWA in 2020 and is valid until September 2025.
2	Spillage of industrial effluent	Prevent spillages of industrial effluent. Where spillage does occur, ensure it is properly contained.
3		Ensure that checking for industrial effluent spills is included in the daily inspection checklist.
4		Report spillages as per the incident management procedure and clean up spills within 24 hours of the incident occurring.
5	Pollution of soil and / or water when spillage or discharge occurs.	In the event of industrial effluent discharge into the environment, stop the incident as soon as possible and then find the root cause.
6		In the event of soil or water pollution, spills will be cleaned up/remediated immediately (within 24 hours) in line with spillage management procedure.

No	Issue	Management commitment
These commitments apply to <u>construction, operation and decommissioning</u>		
7	Prevent industrial effluent from polluting the environment	Ensure that the various effluent streams (tailings decant, treated effluent dirty stormwater, process effluent) are managed to prevent overflow of the process water pond.
8		Ensure that freeboard is maintained at the process water pond and other mine waste facilities to accommodate run-off during a 1:100-year storm event.
9		Monitor the effectiveness of the mitigation measures (e.g. liner) for damage to ensure that seepage does not occur. This will be done by monitoring the water quality downstream of the relevant facilities.
10		Regularly clean the silt trap located at the entrance to the pond to prevent it becoming full and causing blockage.
11		Ensure that storage / containment facilities have sufficient capacity to cater for the various sources of water including rainfall.
12	Discharge of industrial effluent to the process pond and TSF	Ensure that all the industrial effluent is discharged into the process pond and into the TSFs (slurry).
13		Install oil / water separators at all wash bays to separate hydrocarbons from the water. Send the dirty water to the process pond and re-use in operation.
14		Skim separator regularly and dispose of hydrocarbons as per the waste management procedure.
15	Spillage of industrial effluent	Maintain pipes, drains, pumps, valves, etc to minimise the likelihood of leaks.
These commitments apply to <u>construction and operation</u> only		
16	Prevent industrial effluent from polluting the environment	Recycle all process water from the process pond back into the plant as per the design specifications.
17	Storage and disposal of liquid waste (hydrocarbons)	All liquid hydrocarbon waste will be collected, safely stored in sealed drums on impermeable surfaces within bunded areas. These areas will be designed to contain 110% of the volume of one or the largest drum (in a multi-drum setup) and will be equipped with traps and oil separators to contain spilled hydrocarbons. The used hydrocarbon liquid waste will be provided to 3rd parties for recycling. Related records will be kept.

d. Domestic effluent

Objectives

The objective of the management measures is to prevent pollution of surface water, etc. due to domestic effluent.

Actions (commitments)

Table B. 13: Actions (commitments) relating to domestic effluent

No	Issue	Management commitment
These commitments apply to <u>construction, operation and decommissioning</u>		
1	Discharge of raw sewerage and grey water into appropriate sewage treatment facilities	Ensure that French drains / portable facilities constructed during the construction phase are managed until such time as they are no longer used and can be decommissioned.
		Adhere to the requirements of the wastewater and effluent disposal exemption permit No. 669, issued by the DWA in 2020. The permit is valid for 5 years and expires in September 2025. The renewal process should start 6 months before the expiry date.
2	Discharge of treated effluent	Recycle the treated effluent to the lined process pond for reuse in the plant.

No	Issue	Management commitment
3		Conduct regular monitoring to ensure that treated effluent is not being discharged into the environment.
4	Spillage of domestic and treated effluent	Maintain portable facilities, pipes, drains, pumps, valves, etc to minimise the likelihood of leaks.
5		Ensure that checking for domestic and treated effluent spills is included in the daily inspection checklist.
6		Report spillages as per the incident management procedure and clean up spills within 24 hours of the incident occurring in line with the spillage management procedure.
7	Ablution facilities in remote areas (exploration areas, access road, etc)	Ensure that portable toilets are working properly and are cleaned at least weekly, so they do not pollute the surrounding environment or create hygiene problems.
8		Ensure that sewerage from the portable toilets is disposed of at the Walvis Bay or Swakopmund sewage works.
9	Pollution of soil and / or groundwater when spillage occurs.	In the event of domestic effluent discharge into the environment, stop the incident as soon as possible and find the root cause.
10		In the event of soil or water pollution, decontaminate the polluted area(s) using an appropriate methodology. Once clean, rehabilitate the area.
11	Awareness and Training	Train operators to understand the legal requirements and how to achieve compliance.
12		Induct LHU Employees and contractors in the use of the spill management procedure.
13	Storage and disposal of liquid waste (hazardous)	Sewerage sludge on the inlet screen shall be dried, placed in heavy duty plastic bag and stored in a clearly labelled wheely bin at the sewerage plant. The waste bags shall be removed by the sewerage services contractor for disposal at the municipal facilities in Walvis Bay.
These commitments apply to <u>operation and decommissioning</u> only		
14	Discharge of raw sewerage and grey water into appropriate sewage treatment facilities	Discharge sewerage of the driller's camp into a French drain.
15	Treatment of sewerage	Regularly service and maintain sewage plant to keep it in proper working condition.
16		Monitor the sewage treatment plant (STP) and effluent regularly to ensure that the minimum standards as prescribed by DWA are being met.
17	Legal compliance	Conduct regular inspections and audits to determine that the STP meets the requirements as specified in the DWA wastewater and effluent disposal permit No. 669.
These commitments apply to <u>operation</u> only		
18	Treatment of sewerage	Operate the STP according to the operations manual to ensure optimum performance.
19	Discharge of raw sewerage and grey water into appropriate sewage treatment facilities	Enlarge the existing biological STP to treat sewage and grey water generated onsite (if required).

e. Spills

Objectives

The objective of the management measures is to prevent pollution of surface water, etc. due to spillages.

Actions (commitments)

Table B. 14: Actions (commitments) relating to spillages

No	Issue	Management commitment
These commitments apply to <u>construction, operation and decommissioning</u>		
1	Emergency situations – very large or remote spills	Maintain and implement the emergency response procedure to address large scale hydrocarbon or reagent spills on and off-site.
2		Maintain and implement the emergency response procedure for the handling of an off-site uranium oxide (final product) or hazardous chemical/fuel spill.
3	Hydrocarbon spills	Ensure that the company is in possession of the relevant licences and can provide reports that both surface and underground storage tanks are in good condition (as per legal requirements).
4		Ensure that hydrocarbon (used and new fuel and oil) tanks and drums are stored inside bunded areas on impermeable floors for containing spillages. These areas are designed to contain 110% of the volume of one or the largest tank (in a multi-tank setup) and that pumps and pipes are maintained in good working order.
5		All wash bays will be equipped with oil traps and separators. All collected oil will be stored as above.
6		Ensure that all fuel and oil storage facilities (farms) and transport tankers have spill kits.
7		Ensure that the fuel transport company has a system in place to deal with hydrocarbon spills and subsequent cleanup thereof.
8		In the event of a spill, contain the spill and commence with remediation within 24 hours and report as per the incident management procedure. In this regard the remediation options include treatment or disposal of contaminated soils as hazardous waste. The former is generally considered to be the preferred option because with successful remediation the soil resource will be retained in the correct place. The treatment options include bioremediation at the point of pollution, or removal of soils for washing and or bioremediation at a designated area after which the soils are replaced.
9		In cases where spills cannot be cleaned up immediately, monitor seepage into surface water closely.
10		If contamination of water occurs separate hydrocarbons from water before recycling.
11		Ensure that an oil-water separator facility is onsite to treat hydrocarbon polluted water.
12	Domestic and industrial effluent	Prevent effluent spills by ensuring that treatment and storage facilities are adequate and pipes in good condition.
13		Ensure that capacities of the various facilities and pipes are not exceeded.
14		All vehicles and equipment will be serviced in workshops and wash bays with contained impermeable, floors, dirty water collection facilities and oil traps.
15		Contain the spill and clean up within 24 hours and report as per the incident management procedure.
16		Slurry spilled on the ground is to be picked up and transported, in sealed containers, to the TSF or emergency stockpile for disposal.
17		Contain sewerage and industrial effluent spills. The first management priority is to treat the pollution by means of bioremediation. If treatment is not possible or acceptable then the pollution must be excavated, classified as waste and treated as per the waste management procedure.
18		In cases where spills cannot be cleaned up immediately, monitor seepage into surface water closely.

No	Issue	Management commitment
19	Legal Compliance – all spills	Comply with all legal requirements regarding spills and containment structures.
20		Hydrocarbon spills of 200L or more must be reported to MME in terms of Section 49 of the Petroleum Products Regulations 2000.
21	Monitoring of spills – all spills	Ensure that the monitoring of all tanks, pipelines and bunds are included in the daily inspection programme to develop an early detection system for leaks.
22		Update, maintain and implement a maintenance plan for tanks, tankers, pipelines and bunds.
23		Identify post-rehabilitation audit criteria for verifying that remediation has been successful.
24		Conduct periodic audits of facilities to ensure compliance with legal and company standards.
25	Awareness and training – all spills	Induct all LHU employees and contractors in the SHER Policy, spillage management and incident management procedures.
26		Train selected employees in the containment, and handling of spills and in the de-contamination and rehabilitation of affected environments.
27	Emergency situations – – all large or remote spills	Major spillage incidents must be handled in accordance with the emergency response procedure.
28		Identify and contract a service provider / specialist to assist with the handling and clean up of emergency spills off site.
29		Periodically test the emergency response plan.
These commitments apply to <u>operation</u> only		
30	Reagent spills - Sodium bicarbonate (powder), sodium hydroxide (powder), sulphuric acid (liquid), flocculent (resin beads)	Ensure that the reagent supply and or transportation company is in possession of the relevant licences and can provide reports that transport and storage tanks are in good condition.
31		Ensure that reagent tanks are housed inside concrete bunds and that dispensing takes place on an impermeable surface.
32		Ensure that bunds are designed to contain 110% of the volume of one or the largest tank (in a multi-tank setup) and that pumps and pipes are maintained in good working order.
33		Ensure that the reagent supply and or transportation company has a system in place to deal with the variety of spills that might occur and the subsequent cleanup thereof.
34	Process solution spills (Unplanned events – release of large volumes of process solutions such as pregnant liquor and slurry)	Ensure that bunds have been designed to capture any release of solution to the extent of 110 % of the largest tank constructed inside the bunded area.
35		As far as possible keep bunds clean and empty.
36		Ensure that pumps and pipelines are in place to pump solutions from the bunds back into the process.
37		Maintain and implement an emergency procedure for the containment and clean-up of process solutions if bunds are breached and treatment of contaminated areas.
These commitments apply to <u>operation and decommissioning</u> only		
38	Reagent spills - Sodium bicarbonate (powder), sodium hydroxide (powder), sulphuric acid (liquid), flocculent (resin beads)	Contain the spill using appropriate spill kits, as far as possible clean-up within 24 hours as per the MSDS specification and report as per the incident management procedure.
39		All solid reagents to be picked up and placed in the relevant reagent tank for use in the plant. If the reagent is polluted it must be disposed of in a safe disposal site.
40		In the event of a sulphuric acid spill, the area should be contained with sand and neutralized with soda ash or lime. Runoff into water ways and drains should be avoided. All safety precautions will be adhered to.
41		In cases where spills cannot be cleaned up immediately, monitor seepage into surface water closely.
42		If contamination of water occurs, contain the water and treat it, or direct it into the process pond for use into the process plant.
43		Identify and utilise a service provider to assist with the cleanup of very large reagent spills (emergency situations) as required.

B.1.6 Groundwater Management and Mitigation Plan

a. Dewatering

Objectives

The objective of the management measures is to prevent the loss of groundwater to farmers and vegetation (and ecosystems) in the region.

Actions (commitments)

Table B. 15: Actions (commitment) relating to dewatering of the Swakop River

No	Issue	Management commitment
These commitments apply to operational only		
1	Abstraction limit	Ensure that, in line with the DWA abstraction permit No. 10456, water abstraction from the Swakop river (Langer Heinrich Compartment) is restricted to 500 000m^3 per year.
2	Impact of abstracting groundwater from the Swakop River alluvium	Monitor the water levels in the Swakop River, up and down stream of the abstraction boreholes.
3		In addition, the boreholes of closest third party farmers to the north of the abstraction boreholes will be monitored on request. If this monitoring indicates an LHU related decrease in groundwater supply to third parties, appropriate measures will be taken to prevent the decrease from occurring and or to provide the affected third parties with an alternative water supply.
4		Optimise use of water onsite to minimise the need for Swakop River groundwater and monitor the Swakop pipeline regularly to detect and repair leaks.
5		Adhere to the recommendations of Swakop River groundwater model in LOM and for mine closure planning.
6	Legal aspects	Ensure that permit No.10456 for groundwater abstraction ~~and pit dewatering are~~ is renewed as required.
7		Conduct regular audits to ensure that the conditions of the permits are being met.

Refer to the Biodiversity MMP (MMP B.1.3) for mitigation requirements relating to the reduction of water resources as an ecological driver at the Swakop River as well as associated mining activities in the ML.

Table B. 16: Actions (commitment) relating to dewatering of the pits

No	Issue	Management commitment
These commitments apply to operational only		
1	Pit dewatering	Monitor the groundwater levels up- and downstream of the mined-out pits
These commitments apply to operational and closure phases		
2	Pit dewatering	Backfill the mined-out pits and the natural valley and rehabilitate the alluvial surface.

b. Contamination of Groundwater

Objectives

The objective of the management measures is to prevent unacceptable groundwater pollution related impacts.

Actions (commitments)

Table B. 17: Actions (commitment) relating to Groundwater contamination relating to in pit tailings (TSF 3)

No	Issue	Management commitment
These commitments apply to operational phase		
1	Deep paleo-channel aquifer	Avoid mining of deep paleochannel aquifer (usually not mineralised).
These commitments apply to design, operational and closure phases		
2	In-pit tailings	Re-instate the deep paleochannel where necessary to a minimum cross-sectional area above the basement contact such that the active aquifer may be re-instated and aquifer flow uninterrupted.
3		Prevent leakage of tailings water into underlying paleochannel and deep aquifer primarily by means of a low permeability layer geotextile and / or synthetic liner) placed above the backfilled paleochannel.
4		In pit tailings will be covered with a layer of low permeable material to prevent surface clean water interacting with tailings and allowing water flow to continue uninterrupted along the Gawib River.
5		For each tailings compartment/pit suitable drainage and seepage collection systems will be installed.
6		The reconstruction of the Gawib River alluvium should be coordinated and planned together with the deposition of tailings and backfill activities in the mine pit;
7		Implement the partial pervious surround methodology as defined in the SRK Report (SRK, 2011))

Table B. 18: Actions (commitment) relating to Groundwater contamination relating to heap leach facilities

No	Issue	Management commitment
These commitments apply to design and operational phases		
1	Heap leach pads	The detailed design of the heap leach pads will incorporate the principles for pollution prevention. These measures may include multiple impermeable liners, leak detection and collection for the pads, trenches and solution ponds.

Table B. 19: Actions (commitment) relating to Groundwater contamination relating to the processing plant, WRDs and stockpiles

No	Issue	Management commitment
These commitments apply to design and operational phases		
1	Processing plant	Seepage from the existing and proposed processing plant will be captured in sumps and recycled.
2	WRDs and stockpiles	Where relevant appropriate seepage capture systems will be installed for seepage water from stockpiles and waste rock dumps.

Table B. 20: Actions (commitment) relating to Groundwater contamination relating to the water in pits

No	Issue	Management commitment
These commitments apply to the operational phase only		
1	Stormwater captured in open pits	Capture intercepted contaminated seepage in pit sumps to prevent it from mixing with clean ground/surface water inflows;
2		Monitor water quality of wells in the deep paleochannel and groundwater flow into the mine pit during operations;
3		Install dewatering boreholes in case monitoring shows potential pollution of downgradient areas;

Table B. 21: Actions (commitment) relating to Groundwater contamination in general

No	Issue	Management commitment
These commitments apply to operational phase only		
1	Modelling and monitoring	The 2011 groundwater model is outdated and needs to be reconstructed and predictive scenarios have to be run to simulate the system. During operation, the groundwater model has to be updated on a 2-yearly basis.
2		Install piezometers around tailings facilities and paleochannel. Measure water levels and analyse water for pollutants.
3		In all mine phases groundwater monitoring will be performed to confirm the upstream, on-site and downstream water qualities in all three identified aquifers. This will include the drilling of new monitoring wells in the western part of the EPL area and also up to 10km downstream along the flow path of the paleochannel.
4		If monitoring identifies off-site contamination (i.e. outside the mining lease), then a remediation plan will be implemented in consultation with an appropriate specialist and the relevant authorities. Options for remediation would include the capture and treatment of polluted water by means of recovery boreholes.
5	Seepage from facilities - general	Monitor the effectiveness of liners in ponds and bunds to ensure that they are intact and functioning properly.
6		Drill monitoring boreholes at the toe and downstream of potentially polluting facilities to ensure that seepage is detected early on.
7		Take monthly borehole measurements (water levels and presence of pollutants).
8		Ensure that the freeboard of all dams and bunds is maintained to ensure that overflow is prevented.
9	Water balance	Update the water balance monthly and use it as a tool for detecting unaccounted water that was used or for losses e.g. seepage.
These commitments apply to closure phase only		
10	Ongoing seepage	Reactive barriers within the shallow alluvium of the Gawib River could chemically bind seepage contaminants thereby preventing seepage leaving the mine lease area. The barriers should be tested in the laboratory and the field as a possible long-term and self regulatory seepage control measure.
11		As part of closure planning, the designs of any permanent and potentially polluting structures will take consideration of the requirements for long-term pollution prevention and confirmatory monitoring.
These commitments apply to construction, operation and decommissioning		
12	Contaminating groundwater	All hazardous chemicals (new and used), dirty water, mineralised wastes and non-mineralised wastes are handled in a manner that they do not contaminate surface water run-off or where this is not possible, demonstrate through monitoring that the potential contamination is within acceptable limits from a human health and related risk perspective.
13		Prevent pollution through basic infrastructure design and through education and training of workers (permanent and temporary)
14		The required steps to enable fast reaction to contain and remediate pollution incidents. In this regard the remediation options include treatment or disposal of contaminated soils as

No	Issue	Management commitment
		hazardous waste. The former is generally considered to be the preferred option because with successful remediation the soil resource will be retained in the correct place. The treatment options include bioremediation at the point of pollution, or removal of soils for washing and or bioremediation at a designated area after which the soils are replaced
15	Background groundwater levels and quality in Gawib and Swakop Rivers	Monitor boreholes in both rivers to determine natural changes over time, adhering to the recommendations of the monitoring plan.
These commitments apply to <u>operation, decommissioning and closure</u>		
16	Seepage from facilities	Develop an inventory of all facilities that have the potential to create seepage, evaluate the risk of seepage occurring and develop management plans to minimise the risk. This will involve laboratory analysis and interpretation of samples from all the potential seepage sources. An independent accredited laboratory will be used.
17	Contamination of environment when seepage occurs	Maintain and implement response procedures to deal with seepage when it is detected (different responses may be required at different facilities).
18		As far as possible pump all seepage from the ground before it has a chance to intersect the groundwater.
19		If water cannot be removed due to the through flow being too low, then investigate and develop a methodology for treating the polluted environment where possible.
20		In cases where seepage cannot be pumped out immediately, monitor seepage into deeper soils and groundwater where possible.
21		Do not use soils contaminated by seepage in rehabilitation programmes (unless treated).
22		If monitoring identifies off-site contamination (i.e. outside the mining lease) then a remediation plan must be implemented in consultation with an appropriate specialist and the relevant authorities, such that third parties are not exposed to the pollution and related potential health impacts.
23		Options for remediation of groundwater pollution could include the capture and treatment of polluted water.
These commitments apply to <u>all phases</u>		
24	Seepage from waste rock dumps and stockpiles	Monitor groundwater for seepage from stockpiles and waste dumps.
25	Background groundwater levels and quality in Gawib and Swakop Rivers	Keep records of historical monitoring to compare to future monitoring results. The environmental monitoring software MP5 has been installed and maintained by LHU since 2013. All water related monitoring data should be stored and updated in MP5 and staff be trained to maintain these.
26	Monitoring and analysis of groundwater for quality and quantity. .	Groundwater monitoring must be performed in line with the monitoring plan and procedure. In this regard the network might be expanded to include additional boreholes.
27		
28		The programme must cater for both water levels as well as water qualities in identified aquifers.
29		The collection and analysis of samples must be done in accordance with relevant standards.
30		Monitor the water levels in the Swakop River, up and down stream of the abstraction boreholes.
31		Analyse borehole water samples onsite to ensure that potential problems are detected early.

No	Issue	Management commitment
32		Send water samples to accredited laboratories for testing and verification of results.
33	Emergencies	Major spillage incidents will be handled in accordance with the LHU emergency response procedure

c. Groundwater monitoring

Appendix C set out the monitoring points, programme and parameters for monitoring water resources at the mine. The parameters may be modified on the basis of input from an appropriate specialist and or relevant authority. In addition to the above, the mine will record rainfall and evaporation data on a daily basis. Any groundwater contamination detected by the mine will be reported to relevant authorities and the mine together with an appropriate specialist will design and implement appropriate treatment solutions.

In terms of groundwater levels, the results will be compared to simulated water levels. The water qualities will be compared to baseline conditions and relevant water quality guidelines.

The flow of water in rivers, when applicable, will be monitored through a visual inspection and measuring stick methods.

Reporting to the various regulators (MME, MEFT and DWA) will be undertaken at regular intervals (at least bi-annually) during operations.

B.1.7 Resource use Management and Mitigation Plan

a. Consumption of energy (electricity and diesel)

Objectives

The objective of the management measures is to monitor the energy (electricity and diesel) consumption and to find ways to minimise consumption.

Actions (commitments)

Table B. 22: Actions (commitment) relating to energy consumption

No	Issue	Management commitment
These commitments apply to <u>all phases</u>		
1	Understanding LHU's electricity consumption and demand	Maintain the electricity consumption monitoring system.
2		Total consumption to be monitored and recorded and compared with NamPower readings.
3		Maintain the energy management plan that optimises electricity consumption whilst meeting efficiencies to ensure that the cheapest form of electricity is used
4	High consumption of electricity	Maintain the energy management plan that optimises electricity consumption whilst meeting efficiencies.
5	Monitoring of the energy management plan	Review energy consumption in relation to the energy management plan.
6	Awareness and training	Continue to implement an awareness programme pertaining to energy usage.
7	Maintenance of electrical equipment	Maintain the maintenance schedule for all electrical equipment used onsite.

b. Consumption of water

Objectives

The objective of the management measures is to monitor the water consumption and to find ways to optimise water usage.

Actions (commitments)

Table B. 23: Actions (commitment) relating to water consumption

No	Issue	Management commitment
These commitments apply to <u>all phases</u>		
1	Water usage and control	Install and calibrate water flow meters on pipes at selected locations (including tailings lines and dewatering boreholes).
2		Monitor monthly abstraction volumes to ensure that the permitted annual volumes are not exceeded.

No	Issue	Management commitment
3	Maintenance of equipment	Further develop, maintain and implement a comprehensive maintenance programme for tanks, tankers, pumps, pipes ponds and reservoirs.
4	Monitoring of water leaks	Ensure that checking for water spills is included in the daily inspections.
5		Report spillages as per the incident management procedure.
6	Training and awareness	Maintain and implement water awareness programme for LHU employees and contractors.
These commitments apply to operation and decommissioning only		
7	Water usage and control	If groundwater is encountered in the pit, ensure that it is dewatered and used (e.g. in the process plant).
8		Ensure that stormwater falling inside the processing area is captured and directed via drains and pipes to the process pond and re-used.
These commitments apply to operation only		
9	Water usage and control	Revisit the existing operational site wide water balance taking rainfall and the proposed additional processes into account to ensure that the design of the relevant clean and dirty water systems is sufficient to cater for the water volumes associated with the infrequent flood events and that unacceptable discharges of polluted water are prevented.
10		Optimise the recycling of process water in the process plant to reduce the demand for fresh water.
11		Recycle tailings decant water back to the process pond in closed pipes for reuse in the process plant.

c. Use of manufactured materials

Objectives

The objective of the management measures is to monitor the use of manufactured materials and to ensure efficient usage.

Actions (commitments)

Table B. 24: Actions (commitment) relating to the use of manufactured materials

No	Issue	Management commitment
These commitments apply to construction, operation and decommissioning		
1	Transport of hazardous materials	Conduct routine inspections of the supply companies transporting hazardous materials to and from site.
2		Ensure companies compliance to legal and LHU requirements and that the contractor has all the necessary hazardous protection equipment for people and environment in the advent of a spill.
3	Consumption of reagents and chemicals	Monitor reagent consumption monthly.
4		Review and implement best practices for use by cleaning contractors. Monitor compliance.
5		Identify consumables that might qualify to be replaced by more environmentally friendly products and conduct market research on such products.
6	Consumption of consumables (e.g. PPE, paper)	Calculate the volumes of consumables used and determine ways of reducing consumption.
7		Investigate use of alternative (environmentally friendlier) consumables instead of the current products (where applicable).
8		Implement a programme of recovering, reassigning or re-use used engineering equipment.
These commitments apply to operation only		
9	Consumption of reagents and chemicals	Monitor and update the process flow balance regularly to ensure optimum use of reagents.

d. Consumption of fuel

Objectives

The objective of the management measures is to monitor the fuel consumption and to find ways to optimise fuel usage.

Actions (commitments)

Table B. 25: Actions (commitment) relating to fuel consumption.

No	Issue	Management commitment
These commitments apply to <u>construction, operation and decommissioning</u>		
1	Fuel consumption	Maintain and implement the preventive maintenance plan for all equipment and mine vehicles using diesel, petrol and gas onsite to avoid wastage and leakages.
2		Monitor fuel consumption in all departments.
3		Monitor use of diesel heaters.

e. Resources monitoring

The amount of consumed resources such as electricity, fuel, water and manufactured materials will be monitored on a daily basis in line with the respective management procedures. Related reporting will be conducted monthly.

B.1.8 Air Quality Management and Mitigation Plan

a. Dust – non-radiological

Objectives

The objective of the management measures is to prevent unacceptable air quality related pollution impacts.

Actions (commitments)

Table B. 26: Actions (commitment) relating to dust – non-radiological

No	Issue	Management commitment
These commitments apply to operation only		
1	PM_{10}	Install PM_{10} &$PM_{2.5}$ sampler between mining operations and Bloedkoppie.
These commitments apply to construction, operation and decommissioning		
2	Meteorological data	LHU must continue to measure on-site meteorological data.
3	Dust generation from unpaved roads	Additional management measures will be implemented for the main impact source: dust entrainment on unpaved roads. The recommended methods to achieve this are: • Dust suppression through chemical suppressants on the regular used unpaved haul roads between the pit and the WRD. • Reduction in dust entrainment on unpaved roads by limiting vehicle speeds • Considering ways to reduce vehicle movement on unpaved roads (e.g. travel once with a full load instead of twice with a half load)
4	Dust generation from TSF wall construction, plant expansion and additional haul roads	Dust suppression thought effective water sprays.
5	Exposure of drillers at the drillers' camp (after working hours)	Monitor exposure to air quality related impacts of residents of the drillers' camp and if required revisit the position of the drillers' camp and the length of stays of the drillers.
6		The predicted GLCs and dust fallout rates at the drillers' camp are very high and it is recommended that the camp is removed from the mine and the personnel be transported to and from the mine on a daily basis at such a time when the activities happen in the eastern side of the ML..
7	Monitoring, auditing and reporting	Develop and implement a calibration, data validation and maintenance procedure for environmental monitoring equipment.
8		Site inspections and progress reporting must be undertaken at regular intervals (at least quarterly).
9		Environmental audits will be conducted annually and will form part of LHU's overall EMS.
These commitments apply to closure phase		
10	Potentially polluting structures	As part of closure planning the designs of any permanent and potentially polluting structures will, on the basis of impact modelling, incorporate measures to address long-term pollution prevention and confirmatory monitoring.

No	Issue	Management commitment
11	(mineralised waste facilities)	Vegetation cover on restored waste rock dumps to be such to ensure minimal wind and water erosion potential.
These commitments apply to <u>all phases</u>		
12	Monitoring TSP and PM_{10} concentrations	A monitoring programme, to confirm the actual TSP, $PM_{2.5}$ and PM_{10} concentrations, will be implemented for all project phases covering: • source based performance indicators; • a network of fallout buckets for monitoring TSP; • an ambient monitor for PM_{10}; • meteorological monitoring; and • audits and inspections. (Depending on the results of the monitoring, the management actions may need to be revised).
13		Restrict speed of vehicles travelling on unpaved roads.
14		Contract an accredited laboratory to perform the analyses of dust samples. Obtain the analysis procedure from the lab.
15		Develop a procedure for the collection, storage and transport of dust samples to the accredited laboratory for analysis.
16		Analyse data and report back to management monthly.
17	Vehicle movement	Consider ways to reduce vehicle movement on unpaved road.

b. Gaseous emissions

Objectives

The objective of the management measures is to minimise greenhouse gas emissions.

Actions (commitments)

Table B. 27: Actions (commitment) relating to gaseous emissions.

No	Issue	Management commitment
These commitments apply to <u>Design phase</u>		
1	Emissions from HFO boilers	HFO boilers – predicted impacts from the Stage 4 Expansion Project should be reduced by 45% to ensure acceptable GLCs, this is to be achieved either through engineering design and or the installation of sulphur control equipment.
		Emission testing for PM, NOx, SO_2 and CO must be conducted on an annual basis.
These commitments apply to <u>Operations only</u>		
2	Green house gas emissions	Update the green house gas emissions inventory and calculate LHU's annual emission of greenhouse gases.
3		Calculate LHU's annual contribution to green house gas emissions.
4		Investigate ways to decrease LHU's emission of greenhouse gases.
5		Where appropriate implement initiatives to decrease the volume of green house gasses emitted to air.
6	Emissions from diesel generators	The diesel generators will be operated and maintained according to supplier specifications.
7	Emissions from HFO boilers	Conduct passive diffusive sampling once a year at Bloedkoppie to verify the ambient concentrations remain well below the guidelines. Sampling to be conducted for two weeks to a month to establish ambient concentrations of SOx, NOx and VOCs.

c. Air quality monitoring

The air quality monitoring requirements include:

- Continue dust fallout and airborne dust monitoring with specific reference to the major exposure sources. Specific locations upwind and downwind with the accompanying meteorological data should have preference. This would aid future radiological assessments and be of interest for ALARA optimising the position of the camp and providing additional baseline information.
- The target onsite (immediately adjacent to mine activities) dust fallout reading should be 1200mg/m2/day. The target off-site (at the nearest sensitive receptor sites – Bloedkoppie, drillers' camp) dust fallout reading should be 600mg/m^2/day. The absence of a visible dust plume along haul roads, at all tipping points and outside the primary crusher would be the best indicator of effective control equipment in place.
- Conduct passive diffusive sampling once a year at Bloedkoppie to verify the ambient concentrations remain well below the guidelines. Sampling to be conducted for two weeks to a month to establish ambient concentrations of SOx, NOx and VOCs.
- It is proposed that particulate air concentration monitoring include both the thoracic dust fraction (denoted by the fraction with aerodynamic diameters less than 10 µm) or PM_{10}, and the respiratory fraction (denoted by the fraction with aerodynamic diameters less than 2.5 µm) or $PM_{2.5}$. It is proposed that the sampling be done using one standalone PM Monitor.
- The operation of the on-site meteorological station will be continued. Monitoring of wind speed, wind direction, rainfall, temperature and evaporation will be continued. The weather station instrument will be calibrated as per requirements and all monitoring equipment will be maintained for acceptable data quality.
- Regularly assess the effectiveness of the LHU's Air Quality Monitoring and update as deemed necessary.
- The results of LHU's Air Quality Monitoring and Management Program will continue to be reported in the reports submitted to the identified stakeholders. Reporting will be undertaken at regular intervals (at least bi-annually) during operations.

B.1.9 Soil Management and Mitigation Plan

a. Loss of soil resources - pollution

Objectives

The objective of the management measures is to prevent pollution of soils.

Actions (commitments)

Table B. 28: Actions (commitment) relating to loss of soil resources due to pollution

No	Issue	Management commitment
These commitments apply to <u>construction, operation and decommissioning</u> phases		
1	Soil pollution	Ensure that all hazardous chemicals (new and used), dirty water, mineralised wastes and non-mineralised wastes are handled in a manner that they do not pollute soils. This will be implemented through one or more procedure(s) covering the following: • pollution prevention through basic infrastructure design, operational procedures and through education and training of workers (permanent and temporary); • the required steps to enable fast reaction to contain and remediate pollution incidents. In this regard the remediation options include treatment or disposal of contaminated soils as hazardous waste. The former is generally considered to be the preferred option because with successful remediation the soil resource will be retained in the correct place. The treatment options include bioremediation at the point of pollution, or removal of soils for washing and or bioremediation at a designated area after which the soils are replaced; and • Specifications for post rehabilitation audit/monitoring criteria to ascertain whether the remediation has been successful. Refer to the Waste Management MMP B.1.11
2	Drill samples	Remove all drill samples after resource drilling.
3	Emergency	Major spillage incidents will be handled in accordance with the LHU emergency response procedure.
These commitments apply to <u>operation and closure (planning)</u> phases		
4	Long-term pollution	The designs of any permanent and potentially polluting structures will take consideration of the requirements for long-term pollution prevention and confirmatory monitoring.

b. Loss of soil resources – physical disturbance

Objectives

The objective of the management measures is to prevent the loss of soils and related functionality through physical disturbance, erosion and compaction.

Actions (commitments)

Table B. 29: Actions (commitment) relating to loss of soil resources due to physical disturbance

No	Issue	Management commitment
These commitments apply to construction, operation and decommissioning phases		
1	Soil management	A soil management plan will be implemented. The key components are: • limit the disturbance of soils to what is absolutely necessary both in terms of site clearing and in terms of ongoing project development and use of vehicles • where soils have to be disturbed the soil will be stripped, stored, maintained and replaced in accordance with the specifications of the soil management plan; • Even though the footprint of the mineralised waste facilities will never be rehabilitated, strip and store some topsoil from these areas because this valuable resource can be used elsewhere on the site for rehabilitation. In this regard, experience has shown that very few mines ever have enough topsoil for rehabilitation; and • pilot studies will be undertaken during the operation phase to determine the best method of re-creating the subsurface impermeable layer (in its natural form this is calcrete but it may be possible to recreate it with similar material) and crust layers, and restoring their role as ecological drivers.
2		As part of closure planning, the designs of any permanent structures will take into consideration the requirements for long-term erosion prevention and confirmatory monitoring.
3		Refer to "topsoil stockpiling/management" – (component c of this MMP).

c. Topsoil stockpiling / management

Objectives

The objective of the management measures is to ensure that all topsoil stripping, stockpiling and replacement operations will be undertaken in a manner that limits impacts on the soil functionality and to ensure it can be used for rehabilitation as and when required.

Actions (commitments)

Table B. 30: Actions (commitment) relating to topsoil stockpiling/management

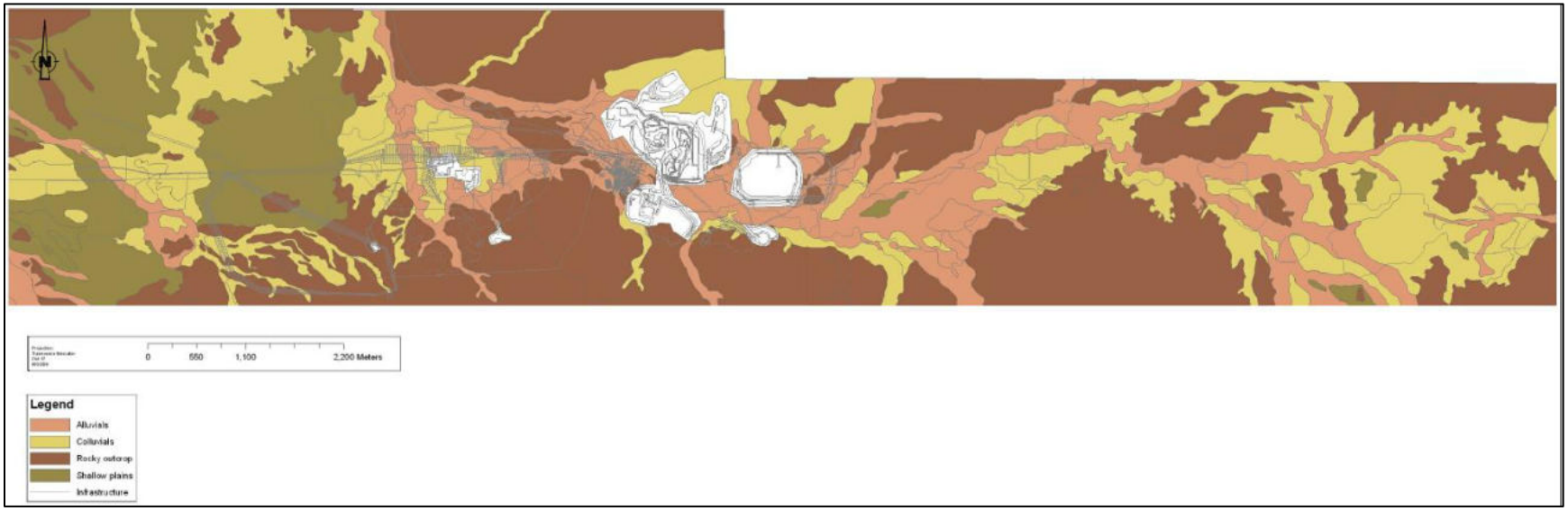
No	Issue	Management commitment
These commitments apply to construction and operation phases		
1	Delineation of stockpiling areas, stockpile management	Limit the disturbance of soils to what is absolutely necessary. Stripping will only occur where soils are to be disturbed by activities described in the 2011 EIA and where clearly defined end rehabilitation use for the stripped soil has been identified.
2		Stockpiling areas will be identified as far as practically possible in close proximity to the source of the soil.
3		Soil stockpiles will be demarcated, and clearly marked to identify both the soil type and the intended area of rehabilitation.
4		Report biannually on the tonnes of topsoil stockpiles stored and used. Indicate where these piles are located.
5		LHU should initiate trial studies on the use of fertilizers and certain erosion control measures as effective soil management tools.
6		Options for preventing erosion of stockpiles could include recreating the crusty layer, rock cladding or establishment of vegetation such as the Vetivier grass.
7		Investigate the possibility of establishing stormwater diversion berms to prevent run-off erosion around stockpiles.
8		Soil stockpiles heights will be restricted where possible to <1.5 m.

No	Issue	Management commitment
9		Where stockpiles higher than 1.5 m cannot be avoided, these will be benched to a maximum height of 15 m. Each bench should ideally be 1.5 m high and 2 m wide.
10		For storage periods greater than 3 years, erosion control is essential, and should be encouraged using the most effective method identified during the trial/pilot studies. The stockpile sides should as far as practically possible be stabilised as a slope of 1 in 6 or less.
11		No waste material will be placed on the soil stockpiles.
12		Equipment movement on top of the soil stockpiles will be limited.
13	Monitoring	Undertake regular monitoring of soils (stockpiles, in its natural state and rehabilitated areas) to ensure effective implementation of measures.
14	Protection of biodiversity	All requirements for moving and preserving fauna and flora according to the biodiversity management programme, biodiversity action plan and land use procedures will be adhered to.
15	Stripping and handling of soils	Handle soils (as far as possible) in dry weather conditions so as to cause as little compaction as possible.
16		Refer to soil stripping plans (Figure B.2) and as far as possible stockpile the material of the same type together.
17		Utilizable soil (topsoil and upper portion of subsoil B2/1 Horizon), the lower “B” horizon (subsoil) and all softs (decomposed rock - soft overburden) must be handled and stockpiled separately.
18		Utilizable soil is considered to be the top 500 mm of soil or until hard rock is encountered where soil depths are <500 mm. The utilizable soil will be stripped and stockpiled together with any vegetation cover present.
19		Where possible, consideration should be given to sequential restoration so that fresh topsoil is used to rehabilitate areas thereby limiting the need to create stockpiles for lengthy periods of time.

d. Soil monitoring

Weekly inspections of soil stockpiles and rehabilitated areas will be undertaken to ensure that the soil conservation procedure is being implemented. The results of the inspection will be incorporated into LHU’s EMS.

Figure B. 2: Soil stripping plan



B.1.10 Visual Management and Mitigation Plan

a. Visual disturbance

Objectives

The objective of the management measures is to limit excessive visual impacts.

Actions (commitments)

Table B. 31: Actions (commitment) relating to visual disturbance

No	Issue	Management commitment
These commitments apply to construction and operational phases		
1	Aesthetics or visual impacts relating to final landforms	The minimum amount of existing vegetation and topsoil will be removed from construction areas. Ensure, wherever possible, that existing vegetation is retained and incorporated in to the site design. Removal of vegetation will be done in a natural manner, avoiding harsh straight lines
These commitments apply operation and decommissioning only		
2	Aesthetics or visual impacts relating to final landforms	Conduct topographical sculpting as part of rehabilitation so that the permanent structures blend in with the natural topography of the surrounding area.
		Reconstruct landscapes to match pre mining landscapes so that they become ecologically functioning units and blend in with similar landscape units.
3		In the shaping of any structures that will remain after closure, harsh, angular and steep slopes will be avoided, and care should be taken to integrate these structures into the surrounding landscape.
4		Dumping and shaping should be implemented such that the sides of the waste rock dumps are articulated in a manner that create areas of light and shadow.
5		Grass seeding and rehabilitation of disturbed areas should be undertaken progressively.
6		Remove all aboveground infrastructure and rehabilitate all disturbed areas including roads.
7		Shape waste rock dumps and seed them with indigenous grass seed.
8		Ongoing management of rehabilitated areas until they are properly established
9		Refer to rehabilitation MMP for more details on closure.

Table B. 32: Landscape management programme

No	Issue	Management commitment
These commitments apply to the construction, operation and decommissioning		
1	Minimising visual impacts	Land disturbance should be limited to what is absolutely necessary.
2		Where practical / possible, buildings and large equipment should be painted with colours that reflect natural colours of the surrounding landscape. Avoid the use of pure whites and blacks.
3		Manage all dust plume sources with dust suppressants to limit visual intrusion by dust in line with the air quality MMP.
4		Only use night lights where necessary. Design to illuminate only that which requires illumination.
5		The use of light is kept to a minimum and where it is required, yellow lighting is used where possible, and vertebrates are kept away from the area around the lights with appropriate fencing where possible;

No	Issue	Management commitment
6		Avoid the use of standard high pole flood lights
7		Prevent littering
8		Sections of the powerline to the Swakop River may be routed in a sleeve aboveground in areas that are particularly sensitive to the visual landscape associated with the battlefields. Rehabilitate workareas after the construction of the powerline and booster pump station.
9		Subject to approval by MEFT (Parks and Wildlife), the perceptions and sensitivity of the tourist viewers from Bloedkoppie will be managed by the placement of tourist information boards about the mine and its visible infrastructure at the time when mining activities move towards the eastern side of the ML.
10		Avoid constructing WRDs and low-grade stockpiles in areas where it is not possible to contour and shape them to fit into their surroundings. As far as possible backfill waste into mined-out pits and locate stockpiles in sterilised sections of the pits.
11		Consider visual impacts when planning location of WRDs and stockpiles.
12		To reduce potential glare the use of bare or shiny metal on plant and buildings should be avoided.

B.1.11 Waste Management and Mitigation Plan

a. Non-hazardous non-radioactive contaminated solid waste (non-mineralised)

Objectives

The objective of the management measures is to ensure proper storage, removal, transportation and disposal of non-hazardous non-radioactive solid waste

Actions (commitments)

Table B. 33: Actions (commitment) relating to Non-hazardous non-radioactive contaminated solid waste (non-mineralised)

No	Issue	Management commitment
These commitments apply to <u>construction, operation and decommissioning</u> phases		
1	General	The waste management procedure for LHU will cover the storage, handling, and transportation of waste. Contractors will be made aware of this procedure which includes their responsibilities.
2	Waste classification	Waste streams will be identified as new types of waste are generated and the company waste inventory will be updated accordingly.
3	Waste collection	Designated waste collection points will be established onsite. Care will be taken to ensure that there will be sufficient collection points with adequate capacity.
4	Waste storage – (domestic and Industrial)	General domestic and recyclable waste from all mine facilities will be temporarily stored in appropriate secure and durable containers until permanent removal from site collection points.
		Domestic waste will be segregated into general and recyclable (paper, cardboard, glass, cans, plastics) waste to reduce waste volumes to landfills.
5		Domestic and recyclable waste generated at auxiliary facilities (e.g BME, drillers' camp) will be properly segregated before transferred to the appropriate containers in the plant area.
6		Waste storage areas and containers will meet the risk needs for the specific waste (e.g. impervious floor, bunded areas with drainage / containment systems, lids to prevent light material from blowing away or sealed containers for hazardous material).
7		Industrial waste generated at workshops and stores will be properly segregated and stored in durable, secure containers.
8		Industrial waste will be recovered and stored at controlled lay-down areas and salvage yards for reuse whenever appropriate.
9	Waste removal and transport (domestic and industrial)	Segregated waste will be scanned for potential radiation contamination before loading and removal from site. An equipment release certificate will be issued for waste approved for offsite removal.
10		Waste will be transported offsite in roadworthy vehicles by competent personnel, well covered and secured.
11		Approved waste management contractor(s) will undertake waste removal from site, transport and disposal at municipal landfills / facilities and distribution to recycling facilities.
12	Waste disposal / distribution (domestic and industrial)	Disposal and distribution of waste will be made at appropriate permitted waste disposal and recycling facilities as follows: o Recyclable to identified recycling companies. o Non-recyclable, non-hazardous waste at the Walvis Bay or Swakopmund municipal landfills.

No	Issue	Management commitment
13	Waste records (domestic and industrial)	Written evidence of radiation level readings, quantities of waste removed, types of waste removed, safe disposal and acknowledgement certificates (where appropriate) will be kept as records.

b. Non-hazardous and hazardous radioactive contaminated solid waste

Objectives

The objective of the management measures is to ensure proper storage and disposal of non-hazardous and hazardous radioactive contaminated solid waste

Actions (commitments)

Table B. 34: Actions (commitment) relating to non-hazardous and hazardous radioactive contaminated solid waste)

No	Issue	Management commitment
These commitments apply <u>construction, operation and decommissioning</u> phases		
1	General	The waste management procedure for LHU will cover the storage, handling, and disposal of radioactive contaminated waste.
2		Employees and contractors will be made aware of the risks associated with radiation contamination and the handling and disposal of such waste.
3	Classification	All waste exceeding radiation levels as per IAEA requirements of waste destined to be released into the public domain will remain onsite.
4		Areas with potential radiation contamination transfer will be identified and control measures implemented as per procedure.
5	Collection	Designated waste collection points will be established onsite. Care will be taken to ensure there will be sufficient collection points with adequate capacity.
6	Storage	Care will be taken to prevent cross contamination of “dirty” and “clean” wastes by providing storage containers nearest to risk areas.
7		Yellow, well labelled containers will be used to store radiation contaminated waste generated from the “Risk Areas” (plant, recovery and laboratory areas).
8		Waste storage containers in the plant area will be open as they may contain large machinery and equipment.
9		Waste storage areas at recovery and laboratory will have concrete floors or bunded areas. Containers will have lids and will be sealed for better control of this hazardous waste.
10		Smaller containers (yellow wheely bins) may be located at specific areas for smaller radioactive contaminated waste.
11	Disposal	LHU will be responsible for the handling and disposal of its radioactive contaminated waste.
12		All radioactive contaminated waste will be disposed of at the dedicated controlled waste disposal facility on the identified WRDs. Engage with a Radiological Specialist and a Geo-hydrologist to obtain input regarding the current storage / disposal practices for a relevant large volume of Radio-active contaminated waste on TSF2 Develop a plan for the current and future disposal of the Radio-active contaminated waste, taking cognisance of the Mine Closure and (likely) ‘end disposal of this waste into one of the open pits.
13	Records	Records of waste types, sources, quantities (estimated and or weighed), ad hoc radiation levels and site locations will be continuously maintained.

c. Hazardous non-radioactive contaminated solid waste (non-mineralised)

Objectives

The objective of the management measures is to ensure proper storage, removal, transportation and disposal of Hazardous non-radioactive solid waste

Actions (commitments)

Table B. 35: Actions (commitment) relating to hazardous non-radioactive contaminated solid waste (non-mineralised)

No	Issue	Management commitment
These commitments apply construction, operation and decommissioning phases		
1	General	The waste management procedure for LHU will cover the storage, handling, and transportation of waste. Contractors will be made aware of this procedure which includes their responsibilities.
2	Waste classification	Waste streams will be identified as new types of waste are generated and the company waste inventory will be updated accordingly.
3	Waste Collection	Designated waste collection points will be established onsite. Care will be taken to ensure that there will be sufficient collection points with adequate capacity.
4		Collection of hazardous waste will be by pre-arrangement with relevant organisations, personnel, facilities.
5	Waste storage	Hazardous waste will be stored in secured suitable containers and accumulated until such time that sufficient quantities can be removed from site.
6		All hazardous waste containers will be well labelled to identify the type of waste stored.
7		Hydrocarbon contaminated soils will be treated at the LHU bioremediation treatment site.
8		Explosives packaging shall be safely burnt / incinerated at the magazine site according to permit conditions and procedures.
9		Medical waste shall be stored in appropriate containers at the First Aid centre until removed by the medics for proper disposal.
10		Ensure that waste storage areas and or containers meet the risk needs for that specific waste (e.g. impervious floor, bunded areas with drainage / containment systems, lids to prevent light material from blowing away or sealed containers for hazardous material).
11	Waste removal and transport	An approved contractor or transport company will undertake the bulk waste transport of hazardous waste to the Walvis Bay hazardous waste site or recycling facilities.
12		Smaller volumes of hazardous waste may be transported by LHU or couriered to various sites for recycling (e.g. printer cartridges)
13		All hazardous waste will be transported as per relevant requirements.
14	Disposal	Waste will be disposed at appropriate permitted waste disposal facilities as follows: o Hazardous waste shall be removed from site and may be disposed off at the Walvis Bay hazardous waste site or recycled at appropriate recycling companies. o Spoiled / redundant reagents and damaged and used reagent bags will be handled by the supplier for repairs, reuse or disposal. o Medical waste shall be incinerated at hospital incinerators.
15		All hazardous waste shall be checked for radiation levels by the radiation officer before removal from site.
16	Disposal records	Written evidence of safe disposal, reused and or recycled waste will be kept.

d. Medical waste

Objectives

The objective of the management measures is to ensure proper storage, removal, transportation and disposal of medical waste

Actions (commitments)

Table B. 36: Actions (commitment) relating to medical waste

No	Issue	Management commitment
These commitments apply <u>construction, operation and decommissioning</u> phases		
1	General	The medical waste handling procedure for LHU will cover the storage, handling, and transportation of all medical waste. Ensure that the contractors responsible are made aware of these procedures.
2	Disposal	Incinerate the medical waste offsite at an approved medical facility.

e. Mineralised waste

Objectives

The objective of the management measures is to ensure proper design, stockpiling and monitoring of waste rock material.

Actions (commitments)

Table B. 37: Actions (commitment) relating to Mineralised waste

No	Issue	Management commitment
These commitments apply to <u>design and closure phases</u>		
1	Visual issues relating to the placing of stockpiles	Avoid constructing waste dumps and low-grade stockpiles in areas where it is not possible to contour and shape them to fit into their surroundings. As far as possible backfill waste into mined-out pits and locate stockpiles in sterilised sections of the pits.
2	Safety issues	Permanent aboveground waste facilities and stockpiles that will remain at closure will be designed and constructed in a manner to present landforms that have similar safety attributes to the natural landforms in the area. In this regard, structures will be stable, protected from flood damage, final voids will be backfilled and steep slopes will be contoured.
These commitments apply to <u>all phases</u>		
3	Erosion of stockpiles	Monitor erosion on waste rock dumps and stockpiles.
4		Rehabilitate eroded areas as soon as possible.
These commitments apply to <u>construction, operation and decommissioning</u>		
5	Disturbance of land, alteration of land use potential and disturbance to biodiversity	As far as possible, stockpile low-grade ore on previously disturbed sites.
6		If new areas of land are to be disturbed, ensure that all potential environmental aspects of the area are considered and implement the land disturbance procedure.
7		Ensure that the important principle of minimising the disturbance footprint of mining and associated activities is included in mine planning. This will include backfilling as much waste as possible into mined-out pits and minimising creation of surface stockpiles.

No	Issue	Management commitment
8		Develop and implement a guideline for optimum design of dumps and stockpiles that achieves a balance between size of footprint and stability of facilities (for safety and rehabilitation purposes).
9		Avoid placement of dumps on the eastern side of the ML. If this is impossible, use the biodiversity sensitivity plans to ensure that waste rock dumps, stockpiles are as far as practically possible not located in areas rated as highly sensitive (orange) or irreplaceable (red).
10		As far as possible avoid placing permanent structures in washes or at the mouths of washes.
11		Develop a rehabilitation plan to ensure that all waste dumps and remaining stockpiles can be rehabilitated into functioning ecological units. Where this is not possible, biodiversity offsets must be investigated in line with the biodiversity management programme.
12	Monitor development of stockpiles	Report biannually on the tonnes of waste generated and where it was disposed, as well as the footprint of the stockpiles.
13	Reporting	Report biannually on the tonnes of low-grade stockpiles stored and used. Indicate where these piles are located.
These commitments apply to operation and decommissioning only		
14	Erosion of stockpiles	As part of rehabilitation planning, where stockpiles remain at closure, stormwater must be diverted away from the waste rock dumps and stockpiles to ensure that these structures do not erode, thereby transporting waste material into restored or undisturbed areas and undermining the stability of the dumps.
15		The waste dumps on the schists are located outside of washes. Prior to closure these dumps must be restored in such a way that they do not erode and that water flows off them into the adjacent tributaries.
16	Seepage from stockpiles	If seepage occurs, contain the seepage and pump this contaminated water to the TSF and into the process pond for reuse in the plant.
17	Groundwater pollution	Once the final configuration of the post closure mineralised waste stockpiles is understood, the stockpile(s) should be considered as potential long-term pollution sources and additional modelling should be done as has been done for the TSFs.

f. Tailings material (TSF)

Objectives

The objective of the management measures is to ensure handling of tailings material and design for TSFs (in-pit and permanent above-ground).

Actions (commitments)

Table B. 38: Actions (commitment) relating to tailings material (TSF)

No	Issue	Management commitment
These commitments should be considered in the design, operational and closure phases		
1	In-pit tailings	Re-instate the deep paleochannel where necessary to a minimum cross-sectional area above the basement contact such that the active aquifer may be re-instated and groundwater flow uninterrupted.
2		Prevent leakage of tailings water into underlying paleochannel and deep aquifer primarily by means of a low permeability layer (e.g. synthetic liner) placed above the backfilled paleochannel.
3		In pit tailings will be covered with a layer of low permeable material to prevent surface clean water interacting with tailings and allowing water flow to continue uninterrupted along the Gawib River.
4		For each tailings compartment/pit suitable drainage and seepage collection systems will be installed.

No	Issue	Management commitment
5		The reconstruction of the Gawib River alluvium should be coordinated and planned together with the deposition of tailings and backfill activities in the mine pit;
6		Implement the partial pervious surround methodology as defined in the SRK Report (SRK, 2011))
7	Failure of TSFs	Conduct risk assessments to understand situations when failure of TSF could occur.
8		Design and manage the TSFs to prevent failure.
9		Develop and implement emergency strategy to deal with massive flows of slurry tailings generated from a breach in a TSF wall.
These commitments apply to <u>all phases</u>		
10	Monitoring the impact of seepage on biodiversity	Conduct regular visual inspections of the condition of surrounding vegetation (trees and shrubs).
11	Seepage	Ensure that all supernatant water is captured and pumped back to the process pond or TSF.
These commitments apply to <u>construction, operation and decommissioning</u> only		
12	Securing the TSF and aboveground pipelines	Barriers and or warning signs will be used to keep people and animals away from the TSF,
13		Develop and implement an emergency response plan for third parties falling into or off hazardous excavations and causing injury.
14	Seepage of tailings	When making use of mined-out areas for in-pit tailings disposal, take care to recreate the aquifers and impermeable layers so that tailings liquor-does not move up through the tailings deposition zone and seep pollution into the more permeable shallow alluvial aquifer of the Gawib River.
These commitments apply to <u>operation</u> only		
15	Managing the TSFs	Operate the TSFs in accordance with their respective operating manuals.
16	Management of TSFs and tailings pipelines	Inspect the operations of TSFs on a weekly basis, i.e. freeboard, water volumes, flow, pipelines, deposition, etc.
17	Understanding the water balance of the TSFs	On a daily basis, report on volumes of tailings slurry sent to the TSFs and volume of decant water recycled to the process pond.
18	Understanding chemistry of the tailings slurry and decant water	Monitor chemistry of the tailings daily.
19		Monitor surface water quality in TSFs regularly.
20		Monitor tailings densities daily.
21	Spillage of tailings (pipeline failure or tank failure at CCD 6)	Monitor slurry pipeline and CCD tanks daily as part of the daily inspection to detect report and mitigate spills promptly.
22	Seepage of tailings	Reduce the ability of the tailings to emit liquid pollution by increasing the density and lowering the tailings water content.
23		Deposit tailings as per the TSF operating manuals
24	Generation of dust from TSFs	Maintain the TSF moisture levels on the beach areas to reduce the formation of dust that could be blown off site.
These commitments apply to the <u>operation and decommissioning</u> only		
25	Management of TSFs and tailings pipelines	Conduct daily inspections on the TSFs and pipelines to check for leaks, incorrect operation, dust etc.
26		Contract an external environmental engineering consultancy to audit compliance with the tailings design, management and operational plan and monitor stability of the dams. This must be done on a regular basis.

No	Issue	Management commitment
27	Understanding the water balance of the TSFs	Measure evaporation from the evaporation pans situated at the TSFs.
28		Monitor slurry and decant water pipelines daily for blockages and leaks.
29	Spillage of tailings (pipeline failure or tank failure at CCD 6)	Implement planned maintenance on pipelines and TSFs and related equipment (e.g. pumps and generators).
30		Ensure that CCD bunds have been designed to hold 110% of the largest tank within the bunded structure on which the CCD facility is erected. The bunds must be maintained in good working order.
31		Clean up spills within 24 hours of the occurrence where possible and dispose of the material in the operational TSF.
32		In the event of major spills, rehabilitate the contaminated area once the spill has been cleaned up.
33	Seepage of tailings	In-pit tailings must be covered with a properly selected succession of layers with different hydraulic properties that prevent flood water to interact with in-pit tailings.
34		Install monitoring boreholes in the tailings and deep paleo-channel aquifer separately to measure water levels (recharge) and analyse water for pollutants.
35		Install moisture sensors in the tailings, that can be read on surface, to monitor discharge/ decanting/ dewatering progress.
36		Ensure that all contaminated water is captured, and pumped back to the process pond or TSF.
37		Ensure that topsoil contaminated by seepage water is not used for rehabilitation but discarded as waste.
38		Ensure that the TSF can accommodate a 1:100 year rainstorm event and that a freeboard of 1 meter is allowed in the construction.
39	Generation of dust from TSFs	Install fall-out dust monitors on and around the TSFs and monitor dust levels.
40	Rehabilitation and closure of TSF's	Develop a rehabilitation strategy and plan for TSFs.
41		Ensure that rehabilitation of TSFs commences during the operational phase.
These commitments apply to <u>operation, decommissioning and closure</u> only		
42	Understanding the water balance of the TSFs	On a regular basis, monitor groundwater for seepage from TSFs and manage the findings accordingly.
43		Monitor water levels in seepage monitoring boreholes to detect abnormal water flows.
44		Develop a process to monitor uranium pH and other parameters of the borehole water. These parameters are used as markers to show if water originates from the TSFs.
45		Manage and regularly update the groundwater model (every 2 years during operation) to develop a better understanding of the hydrological (surface and groundwater) environment, to simulate long-term behaviour including geochemical and to assist with decision making.
These commitments apply to <u>decommissioning and closure</u> only		
46	Rehabilitation and closure of TSF's	Ensure that monitoring of TSFs continues post closure or until rehabilitation completion criteria have been achieved.
47		As part of the progressive rehabilitation ensure that the TSF is restored in such a way that water falling on this facility is able to flow from the facility into the main washes and thus feed downstream users.
48		Develop a rehabilitation strategy and plan for TSFs.

g. Waste and Dirty water system monitoring

Mineralised waste and dirty water system

The following issues will, where relevant, be monitored on a quarterly basis and reported bi-annually:

- Phreatic surface, slope stability, adequacy of freeboard, integrity of walls/liners, the position of the pools, silt trap sediment, presence of seepage, capacity of dirty water system, and functioning of drains.
- The success of rehabilitation measures.
- The effectiveness and integrity of infrastructure that prevents erosion damage and provides flood protection.
- In addition to the above, the volume of mineralised waste (including low-grade ore) generated as well as the disposal area, height and footprint of mineralised waste disposal/storage facilities will be monitored and recorded as required. The results will be reported bi-annually.

Non-mineralised solid and liquid waste

- Weekly inspections of non-mineralised waste handling and management facilities will be undertaken to ensure that the waste management procedures are being implemented. The results of the inspection will be incorporated into LHU's EMS.
- In addition to the above, the volume and type of non-mineralised waste, and the disposal destination, will be monitored and recorded as required. The results will be reported bi-annually.

B.1.12 Noise and Vibrations Management and Mitigation Plan

a. Remote noise pollution

Objectives

The objective of the management measures is to limit excessive noise pollution

Actions (commitments)

Table B. 39: Actions (commitment) relating to remote noise pollution

No	Issue	Management commitment
These commitments apply to <u>construction, operation and decommissioning</u>		
1	Impact of remote noise on the environment	Document and investigate all registered complaints and make efforts made to address the area of concern where possible.
2	Minimise remote noise	As a general rule, the activities (i.e. blasting) most likely to cause noise pollution impacts should be restricted to daytime activities.

b. Vibrations

Objectives

The objective of the management measures is to limit impacts from vibrations

Actions (commitments)

Table B. 40: Actions (commitment) relating to remote noise pollution

No	Issue	Management commitment
These commitments apply to <u>construction, operation and decommissioning</u>		
1	Blasting	Fly rock is contained within 700 m of the blast site
2		Prior to each blast the blast area will be cleared of third parties to a safe distance determined by appropriate legislation and Safe Working Procedures. Prior to each blast an audible warning will be sounded.
3		All registered complaints will be documented, investigated and efforts made to address the area of concern where possible.

B.1.13 Socio-Economic Management and Mitigation Plan

a. Employment creation

Objectives

The objective of the management measures is to enhance the positive impacts associated with job creation.

Actions (commitments)

Table B. 41: Actions (commitment) relating to employment creation

No	Issue	Management commitment
These commitments apply to construction phase only		
1	Employment opportunities and development benefits.	Contractors will be required to provide skills training and development of the contractor workforce.
These commitments apply to operation and decommissioning		
2	Employment opportunities and development benefits.	Revise and implement training policy and programmes. These will include a programme to address the disadvantages of low skills and experience in the labour pool.
3		This programme should be made available to specific contractors who will tailor-make it for their own needs.
4		The LHU Human Resource Development function will design and manage a skills development program. Consider the recommendations provided in the Stage 3 and 4 EIA reports.
7		Employ local unskilled and semi-skilled labour wherever possible.
8		Sets up recruitment offices away from its site and that it advertises job opportunities on the government job posting website.
9		Procures local goods and services where possible

b. Economic development

Objectives

The objective of the management measures is to enhance the positive economic impacts and to limit the negative economic impacts.

Actions (commitments)

Table B. 42: Actions (commitment) relating to economic development

No	Issue	Management commitment
These commitments apply to construction, operation and decommissioning phases		
1	Positive benefit on local and	Continue implementing the policy of local procurement wherever feasible.
2		Continue to develop mechanisms for improving local procurement by assessing local business opportunities for each contract.

No	Issue	Management commitment
3	regional economies	Continue to investigate opportunities and place support mechanisms in place to facilitate the participation of women in the local economy.
4		Procurement strategies should promote small, Namibian companies and should encourage diversification and development of these companies away from dependence on LHU.
5		In order to enhance the regional economic impacts, continue to consider ways to empower, support and use local/regional people for employment and local business for procurement. It will also consider other ways to enhance local economic development.
6		Focus social investment on education, housing, health and sanitation services and infrastructure in the proclaimed towns that already exist in the region.
These commitments apply to operation, decommissioning and closure (planning) phases		
7	Limit the potential negative economic impacts relating to closure	Incorporate economic considerations into closure planning
8		These considerations will cover the skilling of employees for the downscaling, early closure and long-term closure scenarios
9		These considerations will cover the needs of tourism for the downscaling, early closure and long-term closure scenarios.
10		In conjunction with the relevant government departments strive to ensure that serviced erven are available to its employees, employees are able to obtain title to serviced erven, housing stock is available for purchase and or rental in all price categories, building raw materials are available for development without causing undue environmental damage and houses are appropriately designed, professionally built and structurally sound
11		maintain the existing mine clinic for basic preventative health care, assess which medical facilities the families of its unskilled and semi-skilled workers will use and investigate whether the mine can start up privately owned, possibly subsidised, managed health care facilities
12		assess where its employees' children are going to school and liaise with local government and the Department of Education to invest in educational facilities and ensure that any new educational facility is open to all inhabitants of the labour areas
13		work with local departments to ensure that the quality of community infrastructure, especially roads, is not compromised as a result of the mine's usage of such infrastructure
14		avoid setting up mine only townships and instead seek to integrate employees into existing communities and continue with the existing policy of bussing employees to the mine.
15		respect private property assets by maintaining zero tolerance policies against poaching, housebreaking or damage to infrastructure or installations by employees and no driving on private/conservancy land without prior arrangement;
16		encourage employees to actively participate in local sport and cultural activities and if need be create such clubs in established local neighbourhoods and do not restrict membership yo employees only.
17	Limit the potential negative impacts on tourism	Engage with relevant people and entities in the tourism sector to ensure that potential negative impacts from mining are managed in a way that the related impacts on tourism are acceptable. This engagement may be through new or existing collective structures, and it will ideally also involve other mining and exploration companies that have the potential to negatively impact on tourism. The findings and recommendations of the strategic environmental assessment will be incorporated into these collective efforts.

c. Infrastructure – road use

Objectives

The objective of the management measures is to reduce the potential for safety and vehicle related impacts on road users.

Actions (commitments)

Table B. 43: Actions (commitment) relating to road use / traffic

No	Issue	Management commitment
These commitments apply to construction, operation and decommissioning phases		
1	Current and future road use related impacts	Ensure basic road safety behaviour for all employees through training and awareness. Continue with driver trainer programme for all LHU employees to include: complying with speed limits, holding valid licences, ensuring vehicles are roadworthy, zero tolerance for drink driving and using lights appropriately for night driving
2		Contracts between LHU and contractors will ensure that the contractors conform to the same behaviour as employees. Typical issues include: • keeping to safe speed limits; • ensuring that drivers all have valid licenses; • making sure that all vehicles are roadworthy; • zero tolerance for drinking and driving; and • using lights appropriately for night driving.
3		Continue to ensure that all travellers to the mine site, whether visitors or service providers, are aware beforehand of the road conditions and its particular hazards.
4		It will continue with its policy of contributing towards the tarring of the C28.
5	Emergency	Any mine related road accident must be handled in accordance with the emergency response procedure.

d. Inward migration

Objectives

The objective of the management measures is to limit the impacts associated with inward migration.

Actions (commitments)

Table B. 44: Actions (commitment) relating to inward migration

No	Issue	Management commitment
These commitments apply to operation and decommissioning phases		
1	Perceived job opportunities causing inward migration	Collaborate with local and regional government and other entities in the commercial sector to identify and implement interventions that may assist with the prevention of inward migration and or the prevention of the associated negative impacts. More specific recommendations are expected from the regional strategic environmental impact assessment. In this regard, LHU's involvement will be documented for record keeping purposes.

e. Stakeholder consultation

Refer to the Community Communication MMP.

f. Social well-being and community development

Objectives

The objective of the management measures is to reduce negative social wellbeing impacts and where possible, turn them into positives.

Actions (commitments)

Table B. 45: Actions (commitment) relating to social well being and community development

No	Issue	Management commitment
These commitments apply to operations, decommissioning and closure phases		
1	Issues relating to social well being	Implement a stakeholder communication and engagement strategy. The key components of which are: maintaining an inclusive comprehensive stakeholder database that recognises both internal and external stakeholders, encouraging meaningful and transparent communication and information sharing, ongoing monitoring to ensure that the strategy is up to date, and follow up auditing.
2		Develop a formal complaints (grievance) procedure that incorporates measures for receiving, responding, tracking and recording complaints and grievances from both internal and external stakeholders;
3		Maintain an employee profile that can assist with both managing social wellbeing impacts and informing the LHU closure plan – for both long-term planned closure and for unplanned premature downscaling or closure;
4		Develop and implement a programme which address employee well-being in the workplace.
5		Develop worker (i.e. employees) radiation and health programmes that can be extended to contractors and service providers, and into the LHU communities where LHU workers reside (interest communities).
6		Create awareness under employees to consider better financial management practices.

B.1.14 Radiological Management and Mitigation Plan

a. Direct exposure to radiation from in-site sources

Objectives

The objective of the management measures is to prevent radiation related health impacts.

Actions (commitments)

Table B. 46: Actions (commitment) relating to direct exposure to on-site radiation sources

No	Issue	Management commitment
These commitments apply to <u>all phase</u>		
1	3rd party access	Access to the site in general, and to the radiation sources in particular, will be restricted in all mine phases to prevent third parties from being in close proximity to radiation sources that could cause health impacts. This issue will be considered in further detail during the detailed closure planning.
2	Drillers' camp	The occupants of the drillers' camp will be contained within this camp after working hours. The camp will be sited at least 500m away from the on-site radiation sources (mineralised and non-mineralised).
3	Transportation of product	All transported product will continue to be packaged and handled in a manner that third parties cannot be exposed to related radiation. Strict product related security measures will be continued.
4	Monitoring	Sampling of solid samples from the same locations used for the 2009 assessment is to be performed on a three-monthly basis for a period of one year. These samples should be split analysed (full nuclide specific) for the coarse and the fine fraction. These results should then be compared to the original 2009 results to verify the findings. Each sample could be a composite sample but should be collected as per approved methodologies
5	Existing LHU Radiation Management Plan	The existing LHU radiation management plan will be amended to include the findings of the EIA and the commitments in the EMP with specific attention on the management of the direct radiation sources, the related environmental monitoring requirements, and minimising doses to as low as reasonably achievable.
6	Emergency	Any spillage of substances that can expose third parties to unacceptable radiation levels will be handled in accordance with the LHU emergency response procedure.

b. Surface water pathway

Refer to Surface Water / Stormwater MMP (B.1.5 – Component B)

In addition to the commitments in the above-mentioned MMP, the existing LHU radiation management plan will be amended to include the findings of the EIA and the commitments in the EMP with specific attention on the management of the radiological surface water pathway, the related environmental monitoring requirements, and minimising doses to as low as reasonably achievable.

As part of closure planning, the designs of any permanent and potentially polluting structures will consider the requirements for long-term surface water pollution prevention and confirmatory monitoring.

c. Groundwater pathway

Refer to Groundwater MMP (B.1.6 – Component B)

In addition to the commitments in the above-mentioned MMP the following will be done:

- A radiological assessment component will be applied to the additional groundwater modeling work.
- Monitoring of the radio-nuclide content of water will be performed as part of the groundwater monitoring programme.

The existing LHU radiation management plan will be amended to include the findings of the EIA and the commitments in the EMP with specific attention on the management of the radiological groundwater pathway, the related environmental monitoring requirements, and minimising doses to as low as reasonably achievable.

d. Air pathway

Refer to Air Quality MMP (B.1.8 – Component A)

In addition to the commitments in the above-mentioned MMP, the environmental monitoring programmes will be expanded to cover:

- The radio-nuclide components of the TSP and PM_{10}.
- Radon gas emissions concentration and rates (flux) from key sources (tailings facilities, mineralised stockpiles, open pits, radioactive non-mineralised waste) that can be used to validate the generic default values in the specialist report (NECSA 2009) – once of.
- Additional sampling of the radionuclide content of the relevant radioactive dust sources to validate the data used by NECSA and to assist with closure planning.
- Ambient radon gas concentrations in and adjacent to the mining lease.

These environmental monitoring programmes will augment the radiological monitoring that LHU currently undertakes from an occupational health and safety perspective.

The existing LHU radiation management plan will be amended to include the findings of the EIA and the commitments in the EMP with specific attention on the management of the radiological air pathway, the related environmental monitoring requirements, and minimising doses to as low as reasonably achievable.

e. Radiological monitoring

The radiation monitoring will include the following:

- Groundwater monitoring as per Section B.1.6. In this regard, the radionuclide analysis will be done on a 1-year or 5-year basis depending on distance and aquifer type.
- As part of the dust and PM_{10} monitoring programme specified in Section B.1.8, a radionuclide analysis will be done on a quarterly basis.

- Sampling of solid samples from the same sources used for the 2009 assessment is to be performed on a three-monthly basis for a period of one year. These samples should be split analysed (full nuclide specific) for the coarse and the fine fraction. These results should then be compared to the original 2009 results to verify the findings. Each sample could be a composite sample but should be collected as per approved methodologies.
- Radon gas monitoring but with more emphasis on monitoring the major exposure sources. Sampling should focus around taking radon gas measurements at specific locations upwind and downwind from the major sources as well as in different seasons of the year. The wind direction and speed should also be measured to enable correlation between monitoring data and meteorological conditions;
- Radon exhalation measurements for the respective exposure sources in order to investigate the discrepancy found between the calculated and measured radon exhalation rates; and

Reporting will be undertaken at regular intervals (at least bi-annually) during operations.

B.1.15 Archaeology Management and Mitigation Plan

a. Archaeological and cultural sites

Objectives

The objective of the management measures is to prevent the unacceptable loss of archaeological sites and related historical information.

Actions (commitments)

Table B. 47: Actions (commitment) relating archaeological and cultural sites

No	Issue	Management commitment
These commitments apply to <u>construction</u> only		
1	Disturbance of archaeological sites	If archaeological sites are located near to construction sites, cordon off the relevant site and instruct contractors on the procedures to be followed when working in close proximity to archaeological sites.
2		
3		All workers (temporary and permanent) will be educated about the importance of preserving archaeological sites
4		The proposed powerline to the Swakop River must be placed in a way that it does not disturb the battlefield sites, which should be cordoned off by means of clearly visible barriers during construction of the powerline. Further: • Avoid damage disturbance to all these sites by carefully planning and constructing the final routing / placement of the powerline, booster pumpstation and associated infrastructure. • Avoid excavations and trenches. • As far as possible, lay the powerline aboveground – either within a sleeve or on standard poles – as near as possible to the existing track. • All vehicles must stay on the road. • Send an environmental officer out ahead of the working team to establish where the work can be done, thus ensuring that work is not done on heritage sites. • Rehabilitate work areas after construction of the powerline and booster pump station.
These commitments apply to <u>construction, operation and decommissioning phases</u>		
5	Identification of archaeological sites	Educate all workers (temporary and permanent) about the archaeological sites that may be encountered.
6	Disturbance of archaeological sites	When planning new structures, consult the archaeology sensitivity map and avoid, where possible, known archaeological sites. If areas are to be destroyed, report this to the National Heritage Council (NHC) and obtain clearance.
7		Limit mine infrastructure, activities and related disturbance to those specifically identified and described in the 2011 EIA report.
8		Where archaeological sites will be disturbed and or destroyed the information in the specialist report must be used to apply for the necessary permits that are required in terms of the National Heritage Act 2004.
9	Battlefield site north of LHU (on route to the Swakop River)	Access to the battlefield area is maintained via the existing track (only);
10		A draft plan for a possible heritage project based on the battlefield area should be prepared as soon as possible to define the area of interest, the preferred point of access and the position of viewpoints and other amenities in relation to the proposed mine development.

b. Chance heritage finds

Objectives

To ensure that the correct actions are taken to preserve or document chance archaeological finds.

Actions (commitments)

Table B. 48: Actions (commitment) relating chance heritage finds

No	Issue	Management commitment
These commitments apply to <u>construction, operation and decommissioning phases</u>		
1	Chance heritage finds	If relics are found onsite, report these findings to the Environmental Manager who will decide on the appropriate action.
2		Implement the chance find procedure. The key component of which is to ensure that the site remains undisturbed until a specialist has assessed the site, assessed the potential damage, advised on the necessary management steps and advised on the requirements for stakeholder consultation and permitting.
3		If there are any chance finds of archaeological sites that have not been identified and described in the 2009 and 2011 specialist reports, follow the chance find procedure.

B.2 ROLES AND RESPONSIBILITIES AND TARGET DATES

B.2.1 Roles and Responsibilities for Environmental Management and for implementing the various MMPs

B.2.1.1 Managing Director

The LHU Managing Director has overall responsibility for environmental management on the mine and for ensuring this EMP is implemented. To assist in this requirement, LHU has an Environmental department which is dedicated to managing and monitoring the Environmental issues associated with LHU's activities.

B.2.1.2 Other relevant LHU Managers

The LHU Technical Services-, Process-, Engineering-, Financial-, HR, Commerce and Admin Safety, Radiation and Training-, and Supply Chain Managers each have the responsibility for implementing the relevant sections of the various MMP contained in this EMP in their respective departments. Specifically, the commitments / actions under the design, operations, decommissioning and closure phases are relevant.

B.2.1.3 Environmental Department

This Department is responsible for assisting LHU in all environmental and community issues and specifically to ensure that the commitments as set out in this EMP are implemented during the design, operations, decommissioning and closure phases.

In addition to the above, the Environmental Department is responsible for ensuring that all long-term contractors are fully aware of and comply with the contents of this EMP. They will also assist the specific contract managers/persons managing these long-term contractors with their adherence to these commitments made in the EMP.

As part of the construction phase, the Environmental Department needs to ensure that all contractors familiarize themselves with and comply with the construction phase commitments in the various MMPs.

The following specific tasks (amongst others) fall within the Environmental Department's responsibility:

- Integrating this EMP into the EMS and maintaining its relevancy and update (and continuously improving) this system where appropriate.
- Environmental audits and inspections.
- Environmental training and awareness.
- Environmental monitoring.
- Reporting on the environmental issues.
- Liaising with LHU Management and various external stakeholders on Environmental Management (where required).
- Integrating this EMP into the LHU Mine Closure Plan.

B.2.1.4 Long-term Contractors

The long-term Contractor Managers, under the supervision of the LHU Technical Services Manager and Engineering Manager, are responsible for implementing the various commitments in this EMP relating to all mining activities in the operations phase.

B.2.1.5 Construction Contractors

The various Construction Contractor Managers have the responsibility for implementing the construction phase actions and commitments required in the various MMPs.

The requirement to ensure compliance to the various MMPs (construction phase) will be included in the contracts between LHU and its various construction contractors, as well as subcontractors.

B.2.1.6 External specialists

LHU will appoint external environmental specialists, as and when required, to assist with the implementation of certain commitments made in the various MMPs.

B.2.2 Environmental Management Programmes

As part of the EMS (refer to Section A.3) LHU has developed various Environmental Management Programmes. These programmes guide the implementation of the various Environmental requirements for the operations phase of the project.

B.2.3 Mine Closure Strategy and Plan

LHU has developed a draft Mine Closure Strategy and draft Mine Closure. The draft Mine Closure Plan will be updated to include the relevant decommission and closure commitments contained in this EMP.

B.2.4 Target Dates

The target dates for implementing the actions / commitments relating to the operations phase will be included in the respective Environmental Management Programmes, as described above.

The Draft Mine Closure Plan will be updated to include the commitments relating to decommissioning and closure.

B.3 COSTS OF MITIGATION

The relevant management and mitigation requirements stipulated in Section B.1 of this EMP will be considered when the operation budget (including the environmental budget) is updated. Also, the relevant project budgets and various contracts with contractors will include provision for the commitments provided in this EMP.

B.3 GENERAL

B.3.1 Audits and inspections

The environmental manager and or the environmental specialist will conduct internal management audits against the commitments in the EMP. During the construction phase, these audits will be conducted every month. In the operational phase, these audits will be conducted on a bi-annual basis. The audit findings will be documented for both record keeping purposes and for informing continual improvement. In addition, an independent professional will conduct an EMP performance assessment every 2 years. The mine's compliance with the provisions of the EMP and the adequacy of the EMP relative to the on-site activities will be assessed in the performance assessment.

The Environmental Coordinator and Environmental Technicians will conduct weekly and daily inspections relating to the construction activities and normal operations.

B.3.2 Submission of information

As a minimum, the following documents will be submitted to the relevant authorities on an ongoing basis:

- EMP performance assessment, submitted every two years to MME and MEFT.
- Tailings and mineralised stockpile management and risk report, submitted bi-annually to MME, MHSS and MEFT and annually to DWA.
- Non-mineralised waste management and risk report, submitted bi-annually to DWA, MME MHSS and MET.
- Air monitoring reports, submitted annually to MME, MHSS and MET; and
- Water monitoring reports, submitted bi-annually to MME and MEFT and annually to DWA.

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Appendix A: Activity/Facility-aspect-impact Registers

All Phase Activities & Facilities - Aspects

Nr		Aspects associated with consumption of resources	Energy use	Water Resource	Use of Manufactured materials	Fuel consumption	Aspects Associated with waste/pollution generation	soil pollution	Emissions to surface water	Emissions to groundwater	Emissions to land	emissions to air	Aspects associated with noise and visual pollution	noise pollution	visual disturbance	Aspects relating to archaeology	Physical disturbance of archaeological resources	Aspects associated with ecosystems	physical disturbance of soil	physical disturbance of land	physical disturbance of biodiversity	physical disturbance of water courses	Social issues and aspects associated with third party and animal safety	Dewatering of rivers	communication with stakeholders	Hazardous excavations and infrastructure	Radiological issues	Economies	Inward migration	Road use and traffic	Social well being	Emergency relegated aspects	Biodiversity	Emissions to groundwater	Emissions to soil	Air quality	visual
	Construction phase																																			
C1	Borehole abstraction		X	X		X																X		X											
C2	Borrow pits													X											X											
C3	Building roads					X						X				X		X	X	X				X											
C4	Clearing and grubbing					X						X				X		X	X	X						X									
C5	Construction workers - Removing of vegetation and poaching																			X																
C6	Compacting bases					X						X				X		X	X	X																
C7	Construction of surface water containment and/or diversion infrastructure – berms, channels, dams.			X		X															X				X										
C8	Cranes													X											X										
C9	Diesel generators					X						X																								
C10	Dust fallout								X																											
C11	Earth moving equipment					X								X											X										
C12	Employees																													X					
C13	Equipment servicing					X			X																											
C14	Erecting power line		X			X															X														
C15	Foundations													X											X										
C16	General building activities		X			X		X	X		X	X		X					X	X	X				X										
C17	Generators		X			X								X																					
C18	Infrastructure establishment																X				X			X	X										
C19	Management of dirty water							X	X		X										X														
C20	Managing contractors (construction camp and drillers camp site)		X			X															X				X										
C21	New construction activities																							X		X	X	X							
C22	Opening borrow pits and trenches					X						X				X		X	X	X					X	X									
C23	Pipelines													X																					
C24	Power lines		X											X										X	X										
C25	Preparation of the foundations											X				X		X	X	X															
C26	Roads													X																					
C27	Sanitation									X																									
C28	Scaffolding													X											X										
C29	Security lights		X																		X														
C30	Servicing equipment		X							X											X														
C31	Slope stabilization					X						X				X		X	X	X															
C32	Soil stripping					X						X				X		X	X	X															
C33	Stockpiles													X												X	X								
C34	Storage and handling of new and used materials and chemicals							X	X	X	X										X														
C35	Trenches													X											X										
C36	Use of vehicles and equipment that may leak lubricants and fuel							X	X		X										X								X						
C37	Vehicle movement					X								X			X		X	X					X				X						
C38	Vehicle movement and exhaust fumes											X																							
C39	Vehicle movement on access roads, internal roads and off road																				X								X						
C40	Waste management (non-mineralised)							X	X	X	X										X					X									

All Phase Activities & Facilities - Aspects

Nr		Aspects associated with consumption of resources	Energy use	Water Resource	Use of Manufactured materials	Fuel consumption	Aspects Associated with waste/pollution generation	soil pollution	Emissions to surface water	Emissions to groundwater	Emissions to land	emissions to air	Aspects associated with noise and visual pollution	noise pollution	visual disturbance	Aspects relating to archaeology	Physical disturbance of archaeological resources	Aspects associated with ecosystems	physical disturbance of soil	physical disturbance of land	physical disturbance of biodiversity	physical disturbance of water courses	Social issues and aspects associated with third party and animal safety	Dewatering of rivers	communication with stakeholders	Hazardous excavations and infrastructure	Radiological issues	Economies	Inward migration	Road use and traffic	Social well being	Emergency relegated aspects	Biodiversity	Emissions to groundwater	Emissions to soil	Air quality	visual
	Operations phase																																			
O1	Backfill of mine voids and the possibility of settlement			X		X																X														
O2	Borehole abstraction		X	X		X																X		X												
O3	Buildings and equipment														X										X										
O4	Construction of water containment and/or diversion infrastructure – berms, channels, dams.		X	X		X																X			X										
O5	Conveyors		X									X														X	X									
O6	Crushing and screening		X									X		X												X	X									
O7	Diesel Generators					X						X																								
O8	Dirty water management and related facilities									X																										
O9	Drilling and blasting					X						X		X												X	X									
O10	Dust fallout								X																											
O11	Earth moving equipment					X								X												X										
O12	Employees																													X						
O13	Existing and proposed operational activities		X			X																						X	X							
O14	Exploration					X													X	X	X															
O15	Fire or explosion at plant																														X			X	X	
O16	Fluorocarbons - air conditions, fridges, pressurized tins											X																								
O17	General materials handling		X		X							X																								
O18	General operational activities		X		X									X											X	X										
O19	Generators		X			X								X																						
O20	Management of dirty process water/effluent							X	X		X										X															
O21	Management of dirty water							X	X		X										X															
O22	Material handling		X																		X															
O23	material tipping													X																						
O24	Mine development									X						X			X	X	X															
O25	Mineralised waste																										X									
O26	Non-mineralised waste product																										X									
O27	Open pits														X										X											
O28	Ore																								X											
O29	Ore processing		X		X					X											X				X											
O30	Overburden removal					X						X																								
O31	Pipelines									X					X																					
O32	Pit dewatering			X																		X														
O33	Placement of stockpiles			X		X																X														
O34	Power lines		X											X											X											
O35	product (unauthorised handling)																				X															
O36	Sanitation									X																										
O37	Security lights		X																		X															
O38	Servicing equipment		X					X	X	X	X										X															
O39	Soil management activities											X															X									
O40	Soil stripping					X						X																								
O41	Stockpile development					X				X		X				X			X	X	X						X									
O42	Stockpiles														X											X										
O43	Storage and handling of new and used materials and chemicals				X			X	X	X	X										X															
O44	Stormwater Management							X	X	X	X																									
O45	Surface subsidence														X																					
O46	Trenches														X																					
O47	TSF development					X													X	X																
O48	TSFs								X	X					X										X											
O49	TSF failure																														X	X	X			
O50	Use of vehicles and equipment that may leak lubricants and fuel																				X															
O51	Vehicle movement					X						X		X		X			X	X	X					X			X							
O52	Vehicle movement and exhaust fumes											X																								
O53	Vehicle movement on access roads, internal roads and off road											X									X						X			X						
O54	Voids														X										X											
O55	Waste management (mineralised and non-mineralised)							X	X	X	X	X				X					X						X									
O56	Water dams														X										X											

All Phase Activities & Facilities - Aspects

Nr		**Aspects associated with consumption of resources**	Energy use	Water Resource	Use of Manufactured materials	Fuel consumption	**Aspects Associated with waste/pollution generation**	soil pollution	Emissions to surface water	Emissions to groundwater	Emissions to land	emissions to air	**Aspects associated with noise and visual pollution**	noise pollution	visual disturbance	**Aspects relating to archaeology**	Physical disturbance of archaeological resources	**Aspects associated with ecosystems**	physical disturbance of soil	physical disturbance of land	physical disturbance of biodiversity	physical disturbance of water courses	**Social issues and aspects associated with third party and animal safety**	Dewatering of rivers	communication with stakeholders	Hazardous excavations and infrastructure	Radiological issues	Economies	Inward migration	Road use and traffic	Social well being	**Emergency relegated aspects**	Biodiversity	Emissions to groundwater	Emissions to soil	Air quality	visual
	Decommissioning phase																																				
D1	Backfill of mine voids and the possibility of subsidence			X		X																X				X											
D2	Borehole abstraction		X	X		X																X		X													
D3	Clearing and grubbing					X													X	X																
D4	Construction of water containment and/or diversion infrastructure – berms, channels, dams.			X																		X				X										
D5	Cranes					X									X																					
D6	Diesel generators					X						X																								
D7	Dirty water management and related facilities									X																										
D8	Decommissioning activities		X		X	X																		X	X		X	X								
D9	Dust fallout								X																											
D10	Earth moving equipment					X								X												X										
D11	Equipment servicing		X					X	X		X										X															
D12	General building activities		X					X	X		X	X							X	X	X					X										
D13	Generators		X			X								X																						
D14	Management of dirty water							X	X		X										X															
D15	Material handling				X							X									X						X									
D16	Material movement															X			X	X	X															
D17	Material tipping													X																						
D18	Mineralised waste																										X									
D19	Non mineralised waste																										X									
D20	Open pits														X											X										
D21	Ore																										X									
D22	Piles of scrap														X											X										
D23	Piles of rubble														X											X										
D24	Pipelines														X																					
D25	Pit dewatering			X																		X														
D26	Power lines		X												X											X										
D27	Removal of infrastructure					X						X				X					X					X										
D28	Sanitation									X																										
D29	Scaffolding														X																					
D30	Security lights		X																		X															
D31	Servicing equipment									X																										
D32	Slope stabilization									X		X				X			X	X	X															
D33	Soil management activities											X															X									
D34	Soil stripping					X													X	X																
D35	Stockpiles														X											X										
D36	Stockpiles and waste facilities									X																X										
D37	Storage and handling of new and used materials and chemicals				X			X	X	X	X										X															
D38	Stripping of buildings and equipment					X								X																						
D39	Surface Subsidence														X											X										
D40	Trenches														X											X										
D41	TSFs														X											X										
D42	Use of vehicles and equipment that may leak lubricants and fuel					X		X	X		X										X															
D43	Vehicle movement					X								X		X			X	X	X					X										
D44	Vehicle movement and exhaust fumes											X																									
D45	Vehicle movement on access roads, internal roads and off road																				X															
D46	Voids														X											X										
D47	Waste management (mineralised and non mineralised)							X	X	X	X	X															X									
D48	Waste management (non-mineralised)																				X						X									
D49	Waste management (mineralised)											X															X									
D50	Water dams														X											X										
	Closure phase																																				
Cl1	Aftercare and maintenance activities																											X								
Cl2	catchment dams and TSF								X																											
Cl3	Employees																														X					
Cl4	Erosion of final land forms																		X		X															
Cl5	Final voids (if any)														X																					
Cl6	Mineralised and radioactive contaminated non-mineralised waste																										X									
Cl7	Other waste								X																											
Cl8	Permanent stockpiles														X																					
Cl9	Permanent TSF														X																					
Cl10	Permanent water dams														X																					
Cl11	Placement of final land forms with associated water containment and/or diversion infrastructure – berms, channels, dams			X																		X														
Cl12	Remaining infrastructure – surface water management system, TSFs, other mineralised stockpiles and other wastes									X		X																								
Cl13	Seepage from remaining stockpiles, catchment dams and TSF							X													X															
Cl14	Seepage, runoff and dust fallout from remaining mineralised stockpiles,								X																											
Cl15	Settlement in backfilled areas			X																		X														
Cl16	Surface subsidence														X																					
Cl17	Vegetation establishment and maintenance											X																									

Appendix B: Legal Framework

Namibia has passed numerous laws intended to protect the natural environment and mitigate against adverse environmental impacts.

1. RELEVANT ACTS

The following acts are relevant to environmental assessments in Namibia:

- The Public Health Act 36 of 1919.
- The Water Act, No. 54 of 1956 and Water Resources Management Act, No. 11 of 2013.
- National Monuments Act 28 of 1969.
- Soil Conservation Act, No. 76 of 1969 and the Soil Conservation Amendment Act, No. 38 of 1971.
- Hazardous Substance Ordinance, No. 14 of 1974.
- Nature Conservation Ordinance, No.14 of 1975 (as amended).
- Atmospheric Pollution Prevention Ordinance, No. 11 of 1976.
- Petroleum Products and Energy Act, No. 13 of 1990.
- Foreign Investment Act No. 27 of 1990.
- The Constitution of the Republic of Namibia of 1990.
- Nature Conservation General Amendment Act of 1990, the Nature Conservation Amendment Act, No.5 of 1996, and the Nature Conservation Amendment Act, No. 3 of 2017.
- Minerals (Prospecting and Mining) Act, No. 33 of 1992:

  The management and regulation of mining activities are guided by the Minerals (Prospecting and Mining) Act, No. 33 of 1992 as well as the Minerals Policy of Namibia (2004), and fall within the jurisdiction of the MME, while the proposed generation of power also fall under the MME's mandate. Appropriate power generation licencing for this project is required.
- Namibian Water Corporation Act, No. 12 of 1997.
- Road Traffic and Transport Act, 1999 (No. 22 of 1999).
- The Forestry Act, No. 12 of 2001 as amended by the Forest Amendment Act, No. 13 of 2005 and its regulations of 2015.
- National Heritage Act, No. 27 of 2004.
- Electricity Act, No. 4 of 2007
- Labour Act, 2007 (No. 11 of 2007).
- Minerals (Prospecting and Mining) Amendment Act, 8 of 2008.
- Draft Protected Areas and Wildlife Management Bill (2009).
- Environmental Management Act, No. 7 of 2007 and its regulations of 2012.

2. RELEVANT POLICIES

Policies and plans currently in force and relevant to this assessment include:

- The EIA Policy (1995).
- Namibia's Environmental Assessment Policy for Sustainable Development and Environmental Conservation (1995).
- White Paper on the Energy Policy, 1998.
- Namibia Vision 2030.
- National Development Plan, 201/2018 – 2021/2022, guided by Vision 2030.
- Policy for the Conservation of Biotic Diversity and Habitat Protection, 1994.
- Policy for Prospecting and Mining in Protected Areas and National Monuments, 1999.
- Minerals Policy of Namibia (2004).
- Namibia's Second National Biodiversity Strategy and Action Plan (2013-2022).
- SADC Environmental Policy and Regulatory Framework for Mining (2001).
- SADC: Protocol on Mining.
- SADC: Protocol on Energy.
- National Environmental Health Policy (2002).
- National Waste Management Policy (2010).
- The National Climate Change Policy of Namibia (September 2010).
- New Equitable Economic Empowerment Framework Policy, 2011.
- National Rangeland Management Policy and Strategy of 2012
- National Agriculture Policy (2015).
- The National Policy on Prospecting and Mining in Protected Areas (2018).

Further discussion of the National Policy on Prospecting and Mining in Protected Areas is relevant to this particular case.

The MEFT and the MME released the "National Policy on Prospecting and Mining in Protected Areas" in June 2018. This Policy guides decision making with regards to exploration and mining in protected areas. The vision of the Policy is to "develop integrated and sustainable prospecting and mining in Namibia to support economic growth, whilst maintaining the integrity of ecosystems and natural resources, and avoiding degradation of areas highly sensitive for their ecological, social and/or cultural heritage value". The Policy provides, amongst others "protected areas with specific zones to be excluded from Prospecting and Mining".

The mine lease, as well as the NamWater pipeline are located within the NNNP, at 49,768 km^2 the largest game park in Africa and the fourth largest in the world.

MEFT developed a new Management Plan for the NNNP which provides guidelines in terms of revised management areas and management measures (MEFT, 2021). This Management Plan provides, amongst others, an overview of the NNNP; guidelines on the park management objectives, zonation and landscape-level conservation and development. It also describes conservation and management of biodiversity principles, cultural and historical, archaeological and paleontological assets and refers to adaptive management concepts and relevant infrastructure in the park.

3. OTHER GUIDANCE AND REGULATORY FRAMEWORKS

Some international legislation, treaties, standards and guidelines – some to which Namibia is a signatory – are also of relevance, including the following:

- The Stockholm Declaration on the Human Environment, Stockholm 1972.
- The Convention on International Trade in Endangered Species (CITES) of 1973 regulates the trade in endangered species – specifically species threatened with global extinction and species that may become extinct unless trade in them is strictly regulated.
- United Nations Framework Convention on Climate Change (1992).
- The Convention on Biological Diversity (CBD) of 1992 details the preservation of rare and endemic species and Article 14 of the convention requires that EIAs are carried out for projects that are likely to have an adverse effect on biodiversity.
- Vienna Convention for the Protection of the Ozone Layer (1985).
- Montreal Protocol on Substances that Deplete the Ozone Layer (1987).
- Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal (1989).
- United Nation Framework Convention on Climate Change, 1992.
- United Nations Convention on Biological Diversity (1992).
- Kyoto Protocol on the Framework Convention on Climate Change, 1998.
- SADC Protocol on Wildlife Conservation and Law Enforcement, 1999.
- The African Convention on the Conservation of Nature and Natural Resources (revised) 2003.
- SADC Protocol on Forestry, 2002 (entered into force within SADC on 1 September 2006).
- Convention to Combat Desertification.
- Convention on Migratory Species (CMS 2011).
- United Nations Sustainable Development Goals (SDGs) 2015.

Appendix C: Monitoring requirements

The various MMPs (Section B) have covered various aspects of monitoring. This section both augments those requirements and sets further detail where relevant.

C.1 WATER MONITORING

Table C.1 and Table C.2 below set out the monitoring points, programme and parameters for monitoring water resources at the mine. The relevant monitoring points are shown on Figure C.1.

Figure C. 1: Conceptual monitoring network

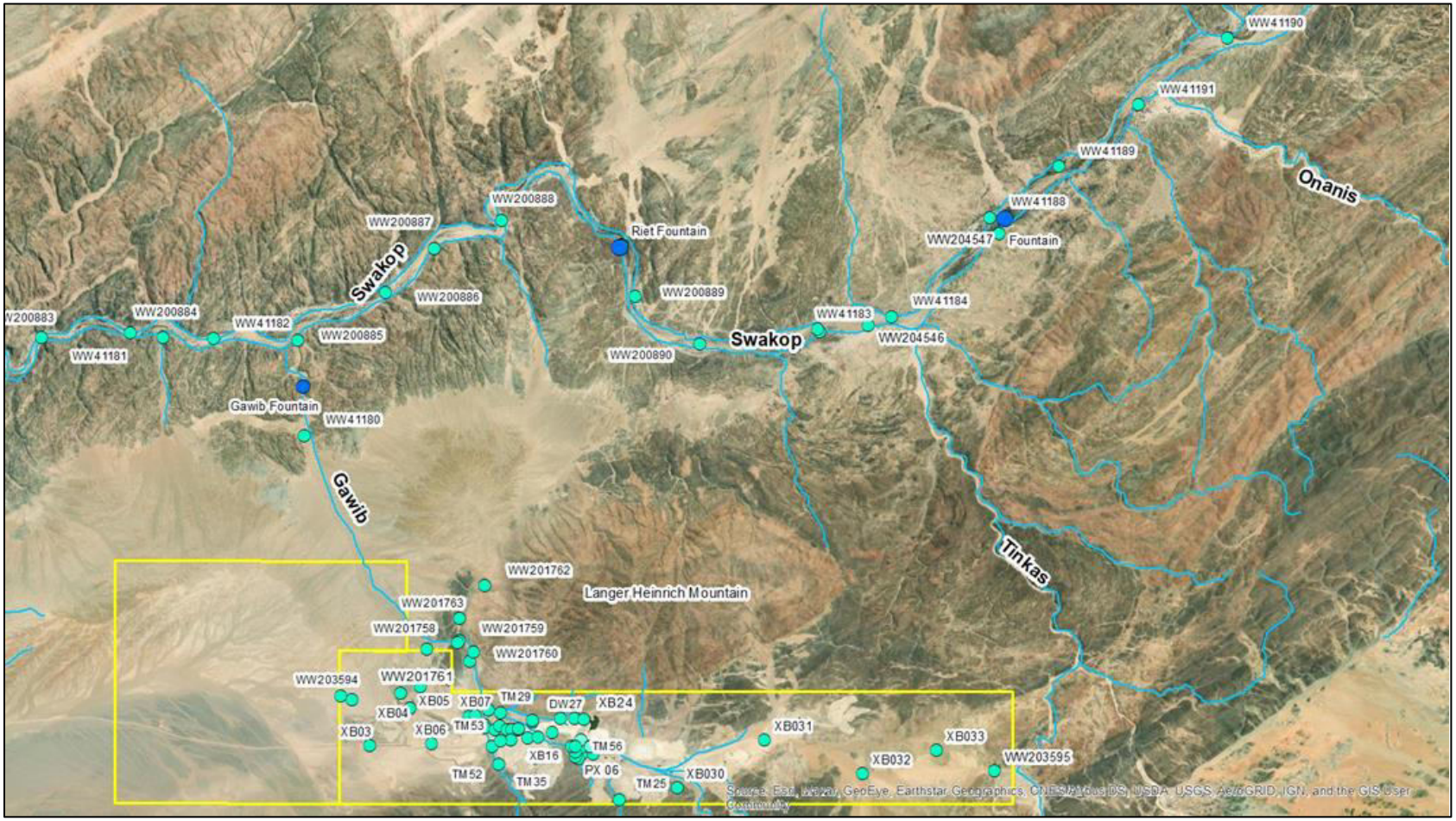

Table C. 1: Water monitoring programme

Borehole ID	Location	Frequency	Aquifer	Borehole ID	Location	Frequency	Aquifer
WW200883	Swakop River	Monthly	Alluvial	XB18	TDF 3	Monthly	Basement
WW200885	Swakop River	Monthly	Alluvial	XB20	TDF 3	Monthly	Basement
WW200886	Swakop River	Monthly	Alluvial	XB22	TDF 3	Monthly	Basement
WW200888	Swakop River	Monthly	Alluvial	XB24	TDF 3	Monthly	Paleochannel
WW200889	Swakop River	Monthly	Alluvial	DW27	TDF 3	Monthly	Basement
WW203545	Swakop River	Monthly	Alluvial	TM35	TDF 2	Monthly	Basement
WW203546	Swakop River	Monthly	Alluvial	TM52	TDF 2	Monthly	Basement
WW203547	Swakop River	Monthly	Alluvial	TM53	TDF 2	Monthly	Basement
WW41181	Swakop River	Monthly	Alluvial	TM58	TDF 2	Monthly	Basement
WW41182	Swakop River	Monthly	Alluvial	XB10	Pit C	Monthly	Paleochannel
WW41180	Gawib River	Monthly	Alluvial	XB30	Pit G	Monthly	Basement
WW41183b	Swakop River	Monthly	Alluvial	PX05	Compacted backfill	Monthly	
WW41188	Swakop River	Monthly	Alluvial	PX06	Compacted backfill	Monthly	
WW41184	Swakop River	Monthly	Alluvial	PX02	Compacted backfill	Monthly	
WW41190	Swakop River	Monthly	Alluvial	PX03	Compacted backfill	Monthly	
WW41191	Swakop River	Monthly	Alluvial	XB019	TDF3	Monthly	Paleochannel
WW201759	Gawib River	Monthly	Basement	XB03	ML West	Monthly	Basement
WW201762	Gawib River	Monthly	Basement	XB04	ML West	Monthly	Basement
TM29	Gawib River	Monthly	Basement				
XB07/1	Gawib River	Monthly	Basement				
XB08	Gawib River	Monthly	Basement				
XB11	Gawib River	Monthly	Basement				
XB09	PIT C	Monthly	Paleochannel				
XB12	PIT C	Monthly	Paleochannel				

Borehole ID	Location	Aquifer/source	Monitoring Frequency	Monitoring Parameters
DW27	TDF3	Basement	Quarterly	Metals/Major ions/Radionuclides (1y)
PX 02	Plant Area	Plant Backfill	Quarterly	Metals/Major ions
PX 06	Plant Area	Plant Backfill	Quarterly	Metals/Major ions
TM29	Gawib River	Basement	Quarterly	Metals/Major ions
WW201757	Gawib River	Basement	Quarterly	Metals/Major ions/Radionuclides (1y)
WW201761	Gawib River	Basement	Quarterly	Metals/Major ions
WW41181	Swakop River	Alluvium	Quarterly	Metals/Major ions/Radionuclides (1y)
WW41183b	Swakop River	Alluvium	Quarterly	Metals/Major ions
XB09	Pit C	Paleochannel	Quarterly	Metals/Major ions/Radionuclides (1y)
XB10	Pit C	Paleochannel	Quarterly	Metals/Major ions/Radionuclides (1y)
XB12	TDF3	Paleochannel	Quarterly	Metals/Major ions/Radionuclides (1y)
XB18	TDF3	Basement	Quarterly	Metals/Major ions
XB20	TDF3	Basement	Quarterly	Metals/Major ions
XB24	TDF3	Paleochannel	Quarterly	Metals/Major ions
PX 01	Plant Area	Plant Backfill	Biannual	Metals/Major ions
XB19	TDF3	Paleochannel	Biannual	Metals/Major ions
PX 03	Plant Area	Plant Backfill	Biannual	Metals/Major ions
WW201760	Gawib River	Basement	Biannual	Metals/Major ions/Radionuclides (1y)
WW41180	Gawib River	Paleochannel	Biannual	Metals/Major ions/Radionuclides (1y)
WW41182	Swakop River	Alluvium	Biannual	Metals/Major ions
XB04	ML West	Basement	Biannual	Metals/Major ions
XB07/1	Gawib River	Basement	Biannual	Metals/Major ions/Radionuclides (1y)
XB03	ML West	Basement	Biannual	Metals/Major ions/Radionuclides (1y)
XB11	Gawib River	Basement	Biannual	Metals/Major ions
XB31	ML East	Paleochannel	Biannual	Metals/Major ions
XB30	Pit G, INFILL	Basement	Biannual	Metals/Major ions
TM53	TDF 2	Basement	Biannual	Metals/Major ions
TM58	TDF 2	Basement	Biannual	Metals/Major ions
TM35	TDF 2	Basement	Annual	Metals/Major ions
TM52	TDF 2	Basement	Annual	Metals/Major ions
TM53	TDF 2	Basement	Annual	Metals/Major ions
TM58	TDF 2	Basement	Annual	Metals/Major ions
WW201758	Gawib River	Basement	Annual	Metals/Major ions/Radionuclides (1y)
WW201762	Gawib River	Basement	Annual	Metals/Major ions
WW201763	Gawib River	Basement	Annual	Metals/Major ions
WW203594	Downstream ML boundary	Basement	Annual	Metals/Major ions
WW203595	Upstream ML boundary	Basement	Annual	Metals/Major ions

Table C.2: Monitoring parameters

Main Ions	Metals	Radionuclides	Onsite measurements
Total dissolved solids	Aluminium as Al	U-238	Groundwater level
Total alkalinity as $CaCO_3$	Arsenic as As	U-234	Temperature
Chloride as Cl	Chromium as Cr	U-235	Redox potential
Fluoride as F	Iron as Fe	Ra-226	Electrical conductivity
Sulphate as SO^4	Manganese as Mn	Ra-228	pH
Nitrate as N	Molybdenum as Mo		
Phosphate as P	Nickel as Ni		
Sodium as Na	Titanium as Ti		
Potassium as K	Uranium as U		
Magnesium as Mg	Vanadium as V		
Calcium as Ca			